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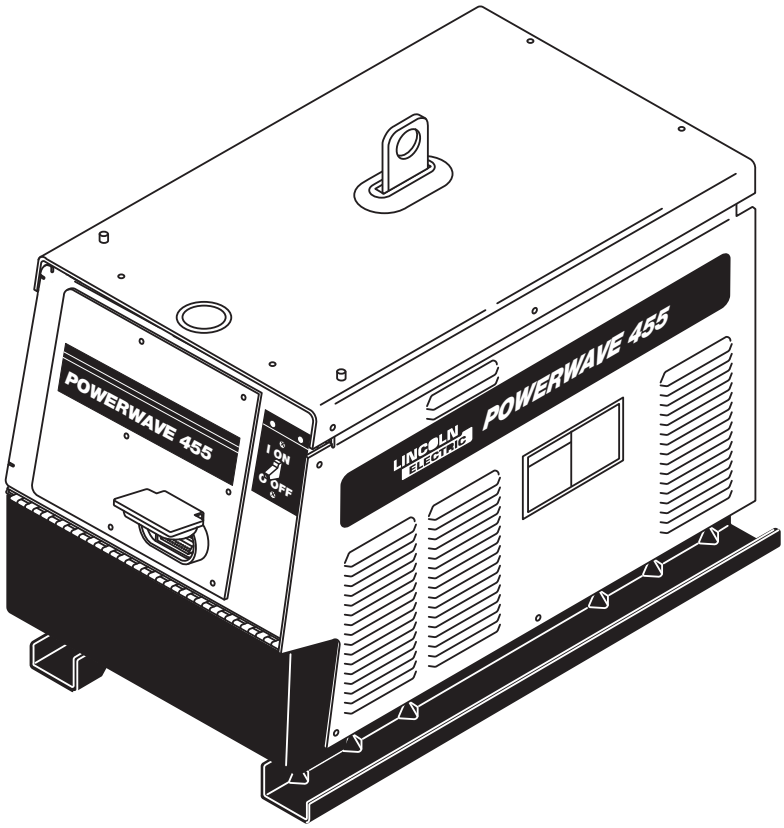
SVM173-A
April, 2007

POWER WAVE™ 455M/STT

For use with machines having Code Numbers: **10942 10957 11007 11008 11057 11153 11152**



Safety Depends on You

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation . . . and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

SERVICE MANUAL

LINCOLN® ELECTRIC

• World's Leader in Welding and Cutting Products •
• Sales and Service through Subsidiaries and Distributors Worldwide •
Cleveland, Ohio 44117-1199 U.S.A. TEL: 1-888-935-3877 WEB SITE: www.lincolnelectric.com

⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

The Above For Diesel Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

The Above For Gasoline Engines

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE powered equipment.

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.

1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.

1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

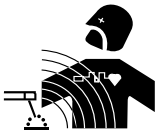
1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.

1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.



ELECTRIC AND MAGNETIC FIELDS may be dangerous

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

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ELECTRIC SHOCK can kill.

3.a. The electrode and work (or ground) circuits are electrically “hot” when the welder is on. Do not touch these “hot” parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- **Semiautomatic DC Constant Voltage (Wire) Welder.**
- **DC Manual (Stick) Welder.**
- **AC Welder with Reduced Voltage Control.**

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. Never simultaneously touch electrically “hot” parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

ARC RAYS can burn.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

FUMES AND GASES can be dangerous.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases.When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below Threshold Limit Values (TLV) using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**

5. b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.e. Read and understand the manufacturer’s instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer’s safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.

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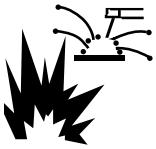


WELDING SPARKS can cause fire or explosion.

6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to “Safety in Welding and Cutting” (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

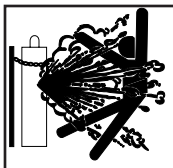
6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”. For information, purchase “Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances”, AWS F4.1 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.



CYLINDER may explode if damaged.

7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically “hot” parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-l, “Precautions for Safe Handling of Compressed Gases in Cylinders,” available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.

FOR ELECTRICALLY powered equipment.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer’s recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer’s recommendations.

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PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.
   d.Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces precautions pour le porte-électrode s'applicuent aussi au pistolet de soudage.

2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.

3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:

   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.

4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.

5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.

7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.

8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.

9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumeés toxiques.

10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement toxique) ou autres produits irritants.

11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.

2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.

3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.

4. Garder tous les couvercles et dispositifs de sûreté à leur place.

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Section A

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TECHNICAL SPECIFICATIONS - POWER WAVE 455M (K2202-1, K2202-3)

INPUT AT RATED OUTPUT - THREE PHASE ONLY

INPUT VOLTS-FREQUENCY	OUTPUT CONDITIONS AMPS / VOLTS / DUTY CYCLE	INPUT CURRENT AMPS	IDLE POWER	POWER FACTOR @ RATED OUTPUT	EFFICIENCY @ RATED OUTPUT
208/230/460/575V - 60HZ.	450A@38V.100% 570A@43V. 60%	58/53/25/22 82/78/37/31	400 Watts Max.	.95 MIN.	88%
200/220/440/575V - 50HZ.	400A@36V.100% 500A@40V. 60%	49/45/23/18 67/61/31/25			

OUTPUT

OPEN CIRCUIT VOLTAGE	CURRENT RANGE AMPS	PULSE FREQUENCY	PULSE VOLTAGE RANGE	PULSE AND BACKGROUND TIME RANGE	AUXILIARY POWER (CIRCUIT BREAKER PROTECTED)
75 VDC	5 - 570A	0.15 - 1000 Hz	5 - 55 VDC	100 MICRO SEC. -3.3 SEC.	40 VDC AT 10 AMPS 115VAC AT 10 AMPS

PROCESS CURRENT RANGE (DC)	CURRENT
MIG/MAG	50-570 Average Amps
FCAW	40-570 Average Amps
SMAW	30-570 Average Amps
GTAW	15-500 Average Amps
Pulse	5-750 Peak Amps

RECOMMENDED INPUT WIRE AND FUSE SIZES FOR MAXIMUM RATED OUTPUT

INPUT VOLTAGE / FREQUENCY	TYPE 75°C COPPER WIRE IN CONDUIT AWG[IEC] SIZES (MM2)	TYPE 75°C GROUND WIRE IN CONDUIT AWG[IEC] SIZES (MM2)	TYPE 75°C (SUPER LAG) OR BREAKER SIZE (AMPS)
208/50/60HZ	4(25)	6(16)	110
230/50/60HZ	4(25)	6(16)	100
460/50/60HZ	8(10)	10(6)	50
575/50/60HZ	10(6)	10(6)	40

PHYSICAL DIMENSIONS

HEIGHT	WIDTH	DEPTH	WEIGHT
26.10 in 663 mm	19.86 in 505 mm	32.88 in 835 mm	286 lbs. 130 kg.

TEMPERATURE RANGES

OPERATING TEMPERATURE RANGE	STORAGE TEMPERATURE RANGE
-20°C to +40°C	-40°C to +40°C

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TECHNICAL SPECIFICATIONS - POWER WAVE 455M/STT (K2203-1)

INPUT AT RATED OUTPUT - THREE PHASE ONLY

INPUT VOLTS	OUTPUT CONDITIONS	INPUT CURRENT AMPS	IDLE POWER	POWER FACTOR @ RATED OUTPUT	EFFICIENCY @ RATED OUTPUT
208/230/460/575V - 60HZ.	450A@38V.100% 570A@43V. 60%	58/53/25/22 82/78/37/31	400 Watts Max.	.95 MIN.	88%
200/220/440/575V - 50HZ.	400A@36V.100% 500A@40V. 60%	49/45/23/18 67/61/31/25			

OUTPUT

OPEN CIRCUIT VOLTAGE	CURRENT RANGE/ STT	PULSE FREQUENCY	PULSE VOLTAGE RANGE	PULSE AND BACKGROUND TIME RANGE	AUXILIARY POWER (CIRCUIT BREAKER PROTECTED)
75 VDC	5-575/5-325	0.15 - 1000 Hz	5 - 55 VDC	100 MICRO SEC. -3.3 SEC.	40 VDC AT 10 AMPS 115VAC AT 10 AMPS

PROCESS CURRENT RANGES (DC)	CURRENT
MIG/MAG	50-570 Average Amps
FCAW	40-570 Average Amps
SMAW	30-570 Average Amps
Pulse	5-750 Peak Amps
STT	40-325 Average Amps

RECOMMENDED INPUT WIRE AND FUSE SIZES FOR MAXIMUM RATED OUTPUT

INPUT VOLTAGE / FREQUENCY	TYPE 75°C COPPER WIRE IN CONDUIT AWG SIZES (mm^2)	TYPE 75°C GROUND WIRE IN CONDUIT AWG SIZES (mm^2)	TYPE 75°C (SUPER LAG) OR BREAKER SIZE (AMPS)
208/50/60HZ	4(25)	6(16)	110
230/50/60HZ	4(25)	6(16)	100
460/50/60HZ	8(10)	10(6)	50
575/50/60HZ	10(6)	10(6)	40

PHYSICAL DIMENSIONS

HEIGHT	WIDTH	DEPTH	WEIGHT
26.10 in 663 mm	19.86 in 505 mm	32.88 in 835 mm	293 lbs. 133 kg.

TEMPERATURE RANGES

OPERATING TEMPERATURE RANGE	STORAGE TEMPERATURE RANGE
-20°C to +40°C	-40°C to +40°C

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SAFETY PRECAUTIONS

Read this entire installation section before you start installation.

⚠ WARNING

ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this installation.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment. Turn off the input power to any other equipment connected to the welding system at the disconnect switch or fuse box before working on the equipment.
- Do not touch electrically hot parts.
- Always connect the Power Wave grounding lug (located inside the reconnect input access door) to a proper safety (Earth) ground.

SELECT SUITABLE LOCATION

Do not use Power Waves in outdoor environments. The Power Wave power source should not be subjected to falling water, nor should any parts of it be submerged in water. Doing so may cause improper operation as well as pose a safety hazard. The best practice is to keep the machine in a dry, sheltered area.

Place the welder where clean cooling air can freely circulate in through the rear louvers and out through the case sides and bottom. Dirt, dust, or any foreign material that can be drawn into the welder should be kept at a minimum. Do not use air filters on the air intake, because the air flow will be restricted. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdowns.

Machines above code 10500 are equipped with F.A.N. (fan as needed) circuitry. The fan runs whenever the output is enabled, whether under loaded or open circuit conditions. The fan also runs for a period of time (approximately 5 minutes) after the output is disabled, to ensure all components are properly cooled.

If desired, the F.A.N. feature can be disabled (causing the fan to run whenever the power source is on). To disable F.A.N., connect leads 444 and X3A together at the output of the solid state fan control relay, located on the back of the Control PC board enclosure. (See the Wiring Diagram.)

⚠ CAUTION

DO NOT MOUNT OVER COMBUSTIBLE SURFACES. Where there is a combustible surface directly under stationary or fixed electrical equipment, that surface shall be covered with a steel plate at least .06”(1.6mm) thick, which shall extend not less than 5.90”(150mm) beyond the equipment on all sides.

LIFTING

Lift the machine by the lift bail only. The lift bail is designed to lift the power source only. Do not attempt to lift the Power Wave with accessories attached to it.

STACKING

Power Wave machines can be stacked a maximum of three high.

⚠ CAUTION

The bottom machine must always be placed on a firm, secure, level surface. There is a danger of machines toppling over if this precaution is not taken.

MACHINE GROUNDING

The frame of the welder must be grounded. A ground terminal marked with the symbol ⏚ is located inside the reconnect/input access door for this purpose. See your local and national electrical codes for proper grounding methods.

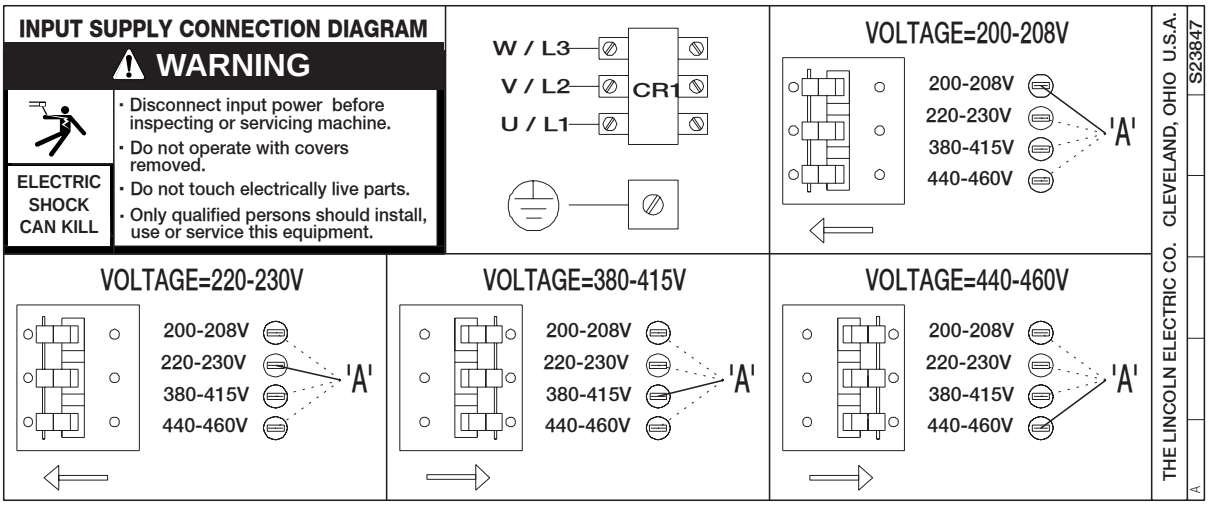
HIGH FREQUENCY PROTECTION

Locate the Power Wave away from radio controlled machinery.

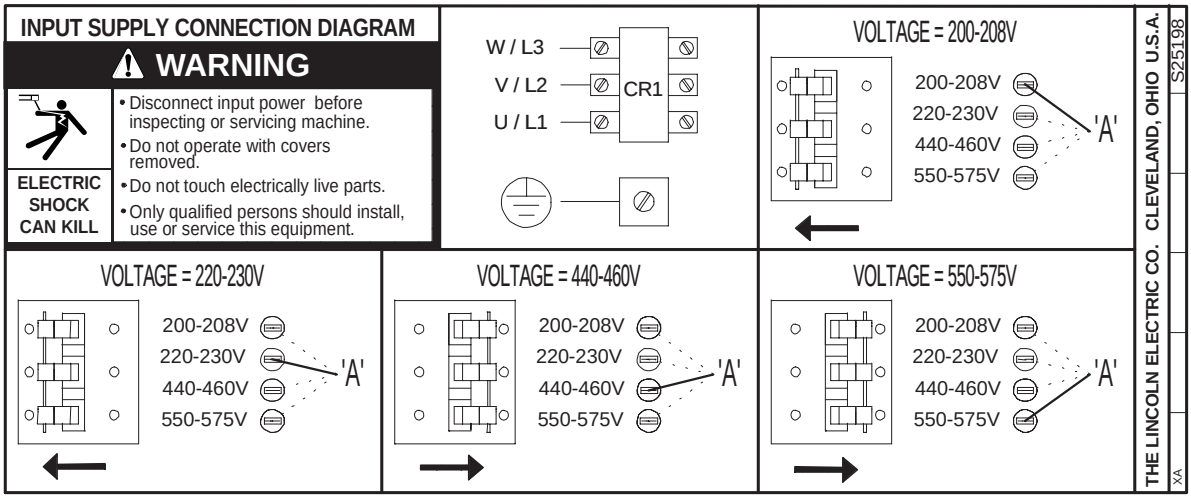
⚠ CAUTION

The normal operation of the Power Wave may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

FIGURE A.1
(K1761-1) CONNECTION DIAGRAM ON CONNECTION/INPUT ACCESS DOOR



(K1761-2) CONNECTION DIAGRAM ON CONNECTION/INPUT ACCESS DOOR



NOTE: Turn main input power to the machine OFF before performing connection procedure. Failure to do so will result in damage to the machine.

INPUT CONNECTION

⚠ WARNING

Only a qualified electrician should connect the input leads to the Power Wave. Connections should be made in accordance with all local and national electrical codes and the connection diagram located on the inside of the reconnect/input access door of the machine. Failure to do so may result in bodily injury or death.

Use a three-phase supply line. A 1.75 inch (45 mm) diameter access hole for the input supply is located on the upper left case back next to the input access door. Connect L1, L2, L3 and ground according to the Input Supply Connection Diagram decal located on the inside of the input access door, or refer to Figure A.1.

INPUT FUSE AND SUPPLY WIRE CONSIDERATIONS

Refer to the ***Technical Specifications*** at the beginning of this Installation section for recommended fuse and wire sizes. Fuse the input circuit with the recommended super lag fuse or delay type breakers (also called “inverse time” or “thermal/magnetic” circuit breakers). Choose an input and grounding wire size according to local or national electrical codes. Using fuses or circuit breakers smaller than recommended may result in “nuisance” shut-offs from welder inrush currents, even if the machine is not being used at high currents.

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INPUT VOLTAGE CHANGE OVER (FOR MULTIPLE INPUT VOLTAGE MACHINES ONLY)

Welders are shipped connected for the highest input voltage listed on the rating plate. To move this connection to a different input voltage, see the diagram located on the inside of the input access door. ***(Figure A.1.)*** If the main reconnect switch or link position is placed in the wrong position, the welder will not produce output power.

If the Auxiliary **(A)** lead is placed in the wrong position, there are two possible results. If the lead is placed in a position higher than the applied line voltage, the welder may not come on at all. If the auxiliary **(A)** lead is placed in a position lower than the applied line voltage, the welder will not come on, and the two circuit breakers in the reconnect area will open. If this occurs, turn off the input voltage, properly connect the **(A)** lead, reset the breakers, and try again.

WELDING WITH MULTIPLE POWER WAVES

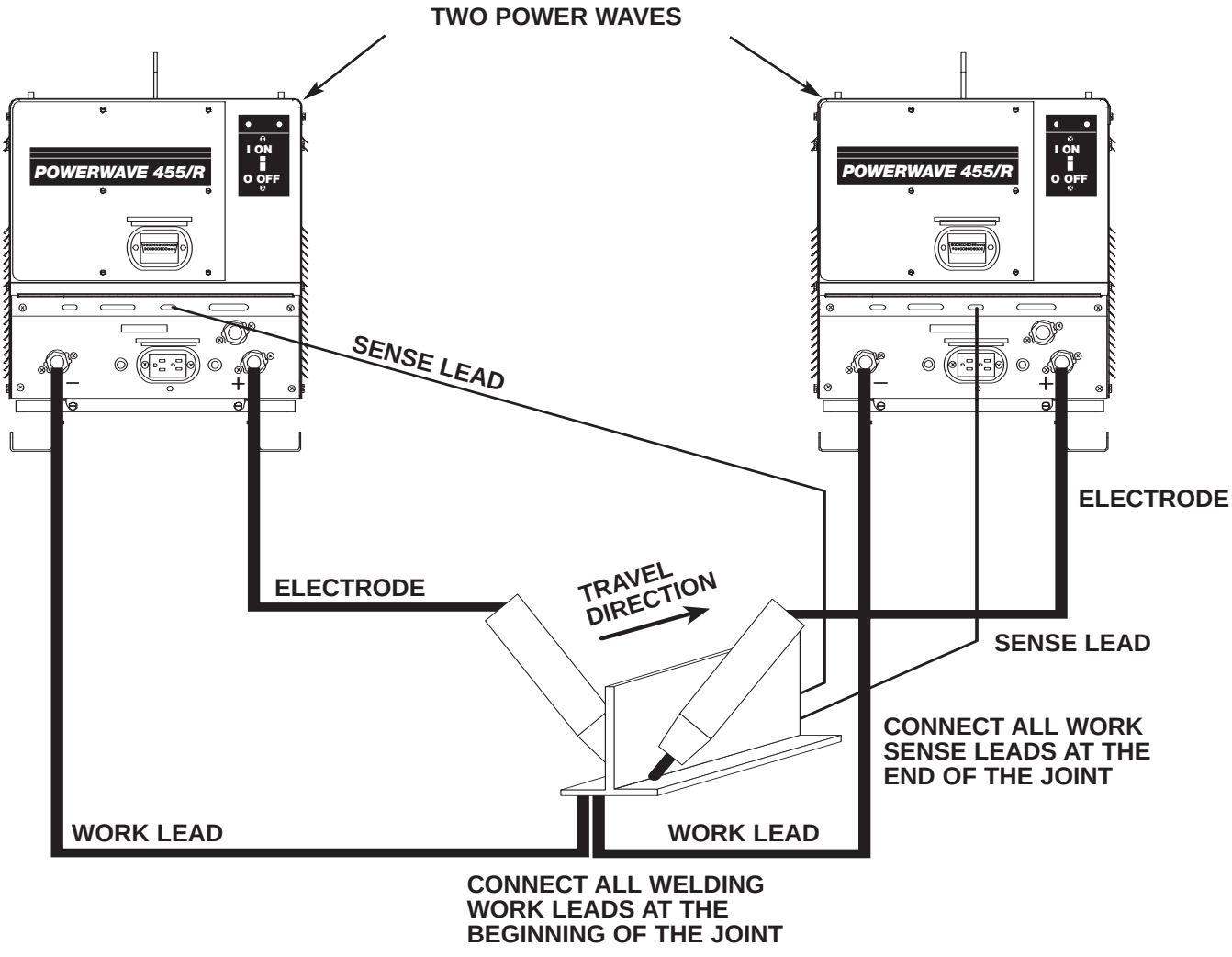
⚠ CAUTION

Special care must be taken when more than one Power Wave is welding simultaneously on a single part. Arc blow and arc interference may occur or be magnified.

Each power source requires a work lead from the work terminal to the welding fixture. Do not combine all of the work leads into one lead. The welding travel directions should be in the direction moving away from the work lead as shown in Figure A.2. Connect all of the work sense leads from each power source to the work piece at the end of the weld.

For the best results when pulse welding, set the wire size and wire feed speed the same for all the Power Waves.

FIGURE A.2 – MULTIPLE POWER WAVE CONNECTIONS



POWER WAVE 455M/MSTT

When these parameters are identical, the pulsing frequency will be the same, helping to stabilize the arcs.

Every welding gun requires a separate shielding gas regulator for proper flow rate and shielding gas coverage.

Do not attempt to supply shielding gas for two or more guns from only one regulator.

If an anti-spatter system is in use, each gun must have its own anti-spatter system. See ***Figure A.2.***

ELECTRODE AND WORK CABLE CONNECTIONS

Connect a work lead of sufficient size and length (per Table A.1) between the proper output terminal on the power source and the work. Be sure the connection to the work makes tight metal-to-metal electrical contact. To avoid interference problems with other equipment and to achieve the best possible operation, route all cables directly to the work or wire feeder. Avoid excessive lengths and do not coil excess cable. Do not tightly bundle the electrode and work cables together.

Use K1796 coaxial welding cables wherever possible.

Minimum work and electrode cables sizes are as follows:

TABLE A.1

(Current (60% Duty Cycle)	MINIMUM COPPER WORK CABLE SIZE AWG Up To 100 Ft. Length (30 m)
400 Amps	2/0 (67 mm^2)
500 Amps	3/0 (85 mm^2)
600 Amps	3/0 (85 mm^2)

When using an inverter type power source like the Power Wave, use the largest welding (electrode and ground) cables that are practical. At least 2/0 copper wire - even if the average output current would not normally require it.

⚠ CAUTION

When pulsing, the pulse current can reach very high levels. Voltage drops can become excessive, leading to poor welding characteristics, if undersized welding cables are used.

Most welding applications run with the electrode being positive (+). For those applications, connect one end of the electrode cable to the positive (+) output terminal on the power source (located beneath the spring loaded output cover near the bottom of the case front). Connect the other end of the electrode cable to the wire drive feed plate using the stud, lockwasher, and nut provided on the wire drive feed plate. The electrode cable lug must be against the feed plate. Be sure the connection to the feed plate makes tight metal-to-metal electrical contact. The electrode cable should be sized according to the specifications given in Table A.1. Connect a work lead from the negative (-) power source output terminal to the work piece. The work piece connection must be firm and secure, especially if pulse welding is planned.

⚠ CAUTION

Excessive voltage drops caused by poor work piece connections often result in unsatisfactory welding performance.

When welding with the STT process, use the positive output connection labeled (STT) for STT welding. (If desired, other welding modes can be used on this terminal; however, their average output current will be limited to 325 amps.) For non-STT processes, use the positive output connection labeled (Power Wave), so that the full output range of the machine is available.

⚠ CAUTION

Do not connect the STT and Power Wave terminals together. Paralleling the terminals will bypass STT circuitry and severely deteriorate STT welding performance.

NEGATIVE ELECTRODE POLARITY

When negative electrode polarity is required, such as in some Innershield applications, reverse the output connections at the power source (electrode cable to the negative (-) terminal, and work cable to the positive (+) terminal).

When operating with electrode polarity negative, the Dip switch 7 must be set to ON on the Wire Feed Head PC Board. The default setting of the switch is OFF to represent positive electrode polarity.

To set the Negative Polarity switch on Wire Feed Head PC board, refer to the section ***DIP SWITCH SETTINGS AND LOCATIONS.***

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VOLTAGE SENSING

The best arc performance occurs when the Power Wave has accurate data about the arc conditions. Depending upon the process, inductance within the electrode and work lead cables can influence the voltage apparent at the terminals of the welder. Voltage sense leads improve the accuracy of the arc conditions and can have a dramatic effect on performance.

⚠ CAUTION

If the voltage sensing is enabled but the sense leads are missing or improperly connected, extremely high welding outputs may occur.

Do not tightly bundle the work sense lead to the work lead.

The sense leads connect to the Power Wave at the four-pin connector located underneath the output terminal cover. Lead 67 senses electrode voltage. Lead 21 senses work voltage.

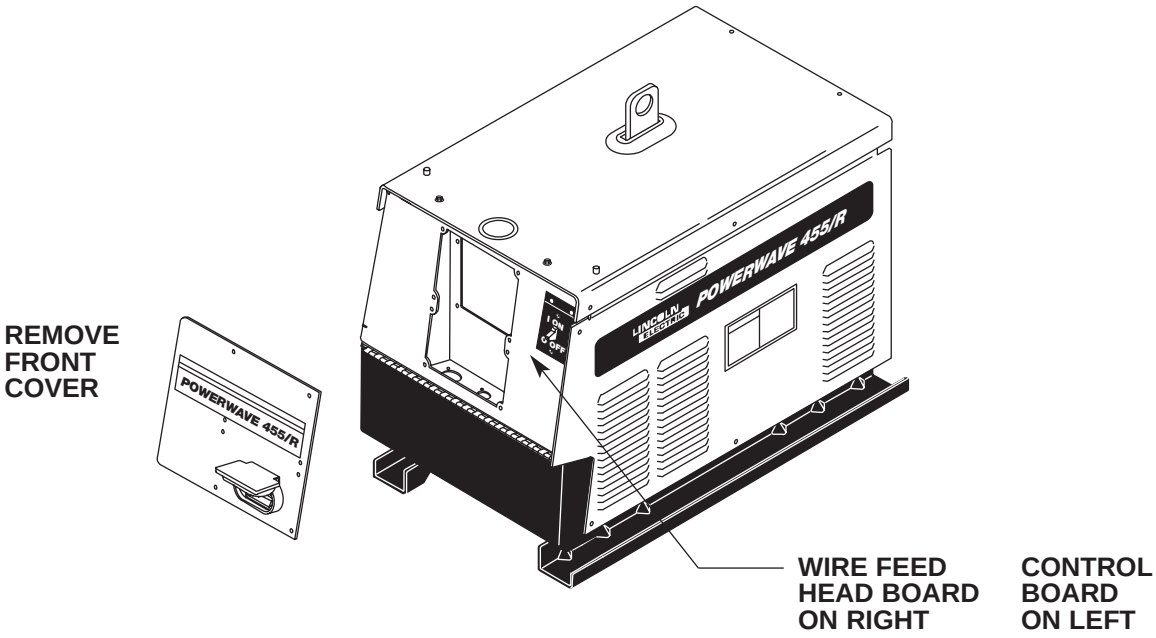
Enable the voltage sense leads as follows:

TABLE A.2

Process	Electrode Voltage Sensing 67 lead *	Work Voltage Sensing 21 lead
GMAW	67 lead required	21 lead optional
GMAW-P	67 lead required	21 lead optional
FCAW	67 lead required	21 lead optional
STT	67 lead required	21 lead required
GTAW	Voltage sense at terminals	Voltage sense at terminals
SAW	67 lead required	21 lead optional

* The electrode voltage 67 sense lead is integral to the control cable to the wire feeder.

FIGURE A.3 – DIP SWITCH LOCATION



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WORK VOLTAGE SENSING

The Power Wave is shipped from the factory with the work sense lead enabled.

For processes requiring work voltage sensing, connect the (21) work voltage sense lead from the Power Wave to the work. Attach the sense lead to the work as close to the weld as practical. To enable the work voltage sensing in the Power Wave, refer to the section ***DIP SWITCH SETTINGS AND LOCATIONS.***

ELECTRODE VOLTAGE SENSING

Enabling or disabling electrode voltage sensing is automatically configured through software. Electrode sense lead 67 must be connected at the wire feeder.

POWER WAVE / POWER FEED WIRE FEEDER INTERCONNECTIONS

Connect the control cable between the power source and wire feeder. The wire feeder connection on the robotic Power Wave is located under the spring loaded output cover, near the bottom of the case front. The control cable is keyed and polarized to prevent improper connection.

For convenience sake, the electrode and control cables can be routed behind the left or right strain reliefs (under the spring loaded output cover), and along the channels formed into the base of the Power Wave, out the back of the channels, and then to the wire feeder.

Output connections on some Power Waves are made via 1/2-13 threaded output terminals located beneath the spring-loaded output cover at the bottom of the case front. On machines which carry the CE mark, output connections are made via Twist-Mate receptacles, also located beneath the spring-loaded output cover at the bottom of the case front.

A work lead must be run from the negative (-) power source output connection to the work piece. The work piece connection must be firm and secure, especially if pulse welding is planned.

⚠ CAUTION

Excessive voltage drops at the work piece connection often result in unsatisfactory pulse welding performance.

CONTROL CABLE SPECIFICATIONS

It is recommended that genuine Lincoln control cables be used at all times. Lincoln cables are specifically designed for the communication and power needs of the Power Wave / Power Feed system.

⚠ CAUTION

The use of non-standard cables, especially in lengths greater than 25 feet, can lead to communication problems (system shutdowns), poor motor acceleration (poor arc starting) and low wire driving force (wire feeding problems).

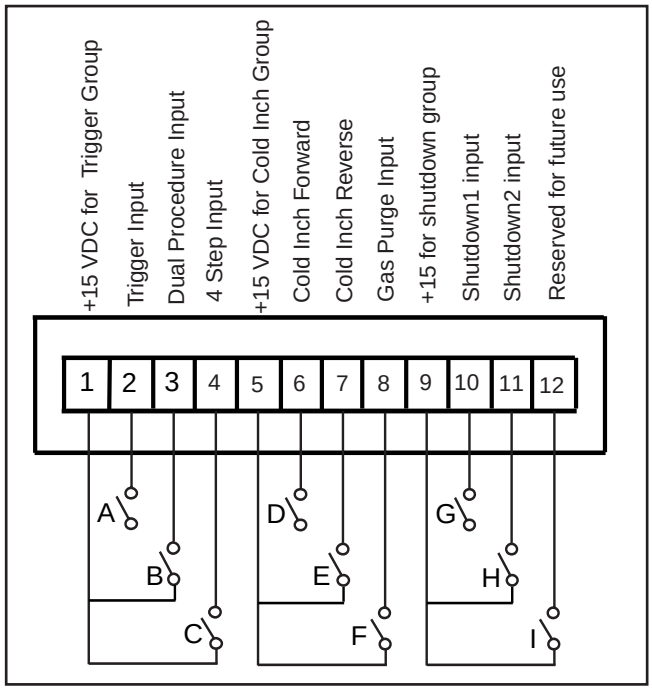
Lincoln control cables are copper 22 conductor cable in a SO-type rubber jacket.

EXTERNAL I/O CONNECTOR

The Power Wave is equipped with a port for making simple input signal connections. The port is divided into three groups: Trigger group, Cold Inch Group and Shutdown Group. Because the Power Wave is a “slave” on the DeviceNet network, the Trigger and Cold Inch Groups are disabled when the DeviceNet/Gateway is active.

The Shutdown Group is always enabled. Shutdown 2 is used for signaling low flow in the water cooler. Unused shutdowns must be jumpered. Machines from the factory come with the shutdowns already jumpered. (See Figure A.4)

FIGURE A.4 – INPUT PORT CONNECTIONS



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DIP SWITCH SETTINGS AND LOCATIONS

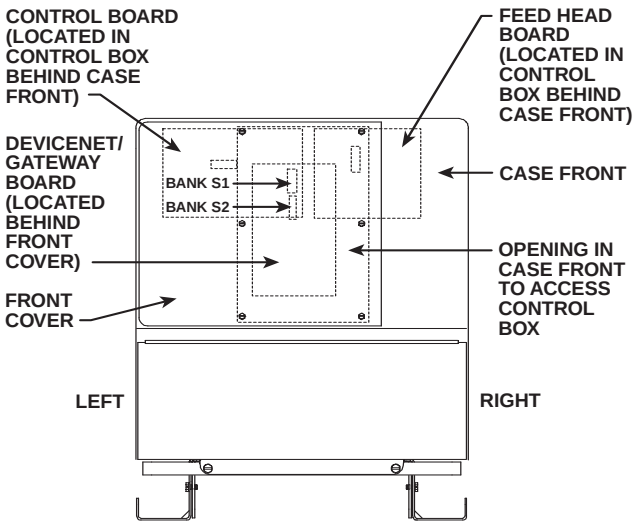
DIP switches on the PC boards allow for custom configuration of the Power Wave. Access the DIP switches as follows:

⚠ WARNING

ELECTRIC SHOCK CAN KILL.

- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

- Turn off power at the disconnect switch.
- Remove the top four screws securing the front access panel.
- Loosen, but do not completely remove, the bottom two screws holding the access panel.
- Open the access panel, allowing the weight of the panel to be carried by the bottom two screws. Make sure to prevent the weight of the access panel from hanging on the harness.
- Adjust the DIP switches as necessary. Using a pencil or other small object, slide the switch left for the ON position or to the right for the OFF position, as appropriate.
- Replace the panel and screws and restore power.



CONTROL BOARD DIP SWITCH:

switch 1 = reserved for future use
switch 2 = reserved for future use
switch 3 = reserved for future use
switch 4 = reserved for future use
switch 5 = reserved for future use
switch 6 = reserved for future use
switch 7 = reserved for future use
switch 8 = work sense lead

switch 8	work sense lead
off	work sense lead not connected
on	work sense lead connected

FEED HEAD BOARD DIP SWITCH:

switch 1 = reserved for future use
switch 2 = reserved for future use
switch 3 = reserved for future use
switch 4 = reserved for future use
switch 5 = reserved for future use
switch 6 = reserved for future use
switch 7 = negative polarity switch
switch 8 = high speed gear

switch 7	electrode polarity
off	positive
on	negative

switch 8	wire drive gear
off	low speed gear
on	high speed gear

DEVICENET/GATEWAY BOARD DIP SWITCH, BANK (S2):

switch 1,2 = configure the baud rate for DeviceNET

Prior to S24958-6 software		
switch 1	**switch 2**	**baud rate**
off	off	-------
on	off	125K
off	on	250K
on	on	500

S24958-6 and later software		
switch 1	**switch 2**	**baud rate**
off	off	125K
off	on	250K
on	off	500K
on	on	500K
Programmable value. Consult local Lincoln Technical representative.		

switch 5 = reserved for future use
switch 6 = reserved for future use
switch 7 = reserved for future use
switch 8 = reserved for future use

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SAFETY PRECAUTIONS

Read this entire section of operating instructions before operating the machine.

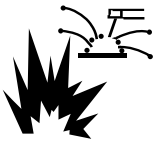
⚠ WARNING

ELECTRIC SHOCK can kill.

- Unless using cold feed feature, when feeding with gun trigger, the electrode and drive mechanism are always electrically energized and could remain energized several seconds after the welding ceases.
- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

FUMES AND GASES can be dangerous.

- Keep your head out of fumes.
- Use ventilation or exhaust to remove fumes from breathing zone.



WELDING SPARKS can cause fire or explosion.

- Keep flammable material away.
- Do not weld on containers that have held combustibles.

ARC RAYS can burn.

- Wear eye, ear, and body protection.

Observe additional guidelines detailed in the beginning of this manual.

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GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL

	INPUT POWER		SMAW
	ON		GMAW
	OFF		FCAW
	HIGH TEMPERATURE		GTAW
	MACHINE STATUS	U_0	OPEN CIRCUIT VOLTAGE
	CIRCUIT BREAKER	U_1	INPUT VOLTAGE
	WIRE FEEDER	U_2	OUTPUT VOLTAGE
	POSITIVE OUTPUT	I_1	INPUT CURRENT
	NEGATIVE OUTPUT	I_2	OUTPUT CURRENT
	3 PHASE INVERTER		PROTECTIVE GROUND
	INPUT POWER		
3 ~	THREE PHASE		WARNING OR CAUTION
	DIRECT CURRENT		

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GENERAL DESCRIPTION

The Power Wave power source is designed to be a part of a modular, multi-process welding system. Depending on configuration, it can support constant current, constant voltage, Surface Tension Transfer and pulse welding modes.

The Power Wave power source is designed to be used with the family of Power Feed wire feeders, operating as a system. Each component in the system has special circuitry to “talk with” the other system components, so each component (power source, wire feeder, electrical accessories) knows what the other is doing at all times. The components communicate using ArcLink protocol.

Robotic systems can communicate with other industrial machines via DeviceNET protocol. The result is a highly intigrated and flexible welding cell.

The Power Wave 455/R is a high performance, digitally controlled inverter welding power source capable of complex, high-speed waveform control. Properly equipped, it can support the GMAW, GMAW-P, FCAW, GTAW and STT processes. It carries an output rating of either 450 amps, 38 volts; or 400 amps, 36 volts (both at 100% duty cycle), depending on input voltage and frequency. The Surface Tension transfer process (STT) is supported at currents up to 325 amps, at 100% duty cycle.

If the duty cycle is exceeded, a thermostat will shut off the output until the machine cools to a reasonable operating temperature.

DESIGN FEATURES AND ADVANTAGES

- Designed to the IEC 974-1 Standard.
- Power Wave 455 multiple process output ranges: 5 - 570 amps
- Easy access for input connections. Connections are simple strip and clamp (no lugs required).
- F.A.N. (Fan As Needed). Cooling fan runs only when necessary (above Code 10500 only, and all STT machines).
- Modular construction for easy servicing.
- Thermostatically protected.
- Electronic over-current protection.
- Input over-voltage protection.
- Utilizes digital signal processing and microprocessor control.
- Simple, reliable input voltage change over.
- All system components communicate and transfer information.
- Auto device recognition simplifies accessory cable connections.

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RECOMMENDED PROCESSES AND EQUIPMENT

RECOMMENDED PROCESSES

The Power Wave 455/R can be set up in a number of configurations, some requiring optional equipment or welding programs. Each machine is factory preprogrammed with multiple welding procedures, typically including GMAW, GMAW-P, FCAW, GTAW and STT for a variety of materials, including mild steel, stainless steel, cored wires, and aluminum. The STT process supports mild steel and stainless steel welding.

The Power Wave 455/R is recommended only for automatic or mechanized applications such as robotic welding.

RECOMMENDED EQUIPMENT

Automatic Operation

All welding programs and procedures are set through software for the robotic Power Wave. FANUC robots equipped with RJ-3 controllers may communicate directly with the Power Wave. Other pieces of equipment such as PLCs or computers can communicate with the Power Wave using DeviceNET. All wire welding processes require a robotic Power Feed wire feeder.

REQUIRED EQUIPMENT

- PF-10/R Wire Feeder, K1780-1
- Control Cables (22 pin to 22 pin), K1795-10,-25,-50,-100
- Control Cables (for use on FANUC robot arm, 22 pin to 14 pin, 10 ft), K1804-1
- Control Cables (for use on FANUC robot arm, 22 pin to 14 pin, 18 in), K1805-1
- Control Cables (for use on FANUC robot arm, 22 pin to 14 pin, 18 in), K1804-2

LIMITATIONS

- The Power Wave 455/R is not suitable for SMAW, CAC-A or other processes not listed.
- Power Waves are not to be used in outdoor environments.
- Only ArcLink Power Feed wire feeders and user interfaces may be used. Other Lincoln wire feeders or non-Lincoln wire feeders cannot be used.

DUTY CYCLE AND TIME PERIOD

The Power Feed wire feeders are capable of welding at a 100% duty cycle (continuous welding). The power source will be the limiting factor in determining system duty cycle capability. Note that the duty cycle is based upon a ten minute period. A 60% duty cycle represents 6 minutes of welding and 4 minutes of idling in a ten minute period.

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CASE FRONT CONTROLS

All operator controls and adjustments are located on the case front of the Power Wave. (See Figure B.1)

1. POWER SWITCH: Controls input power to the Power Wave.
2. STATUS LIGHT: A two color light that indicates system errors. Normal operation is a steady green light. Error conditions are indicated, per Table B.1.

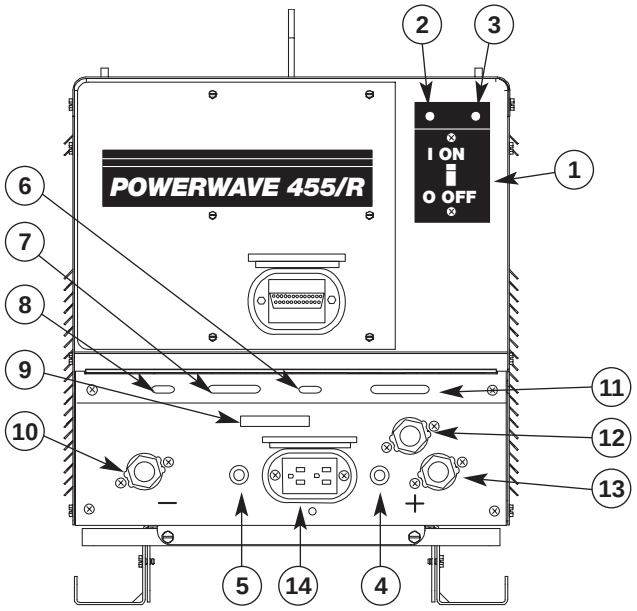
NOTE: The robotic Power Waves' status light will flash green, and sometimes red and green, for up to one minute when the machine is first turned on. This is a normal situation as the machine goes through a self test at power up.

TABLE B.1

Light Condition	Meaning
Steady Green	System OK. Power source communicating normally with wire feeder and its components.
Blinking Green	Normal for first 1-10 seconds after power is turned on.
Alternating Green and Red	Non-recoverable system fault. Must turn power source off, find source of error, and turn power back on to reset. See ***Troubleshooting Guide.***
Steady Red	See ***Troubleshooting Guide.***

3. HIGH TEMPERATURE LIGHT (thermal overload): A yellow light that comes on when an over temperature situation occurs. Output is disabled until the machine cools down. When cool, the light goes out and output is enabled.
4. 10 AMP WIRE FEEDER CIRCUIT BREAKER: Protects 40 volt DC wire feeder power supply.
5. 10 AMP AUXILIARY POWER CIRCUIT BREAKER: Protects 115 volt AC case front receptacle auxiliary supply.
6. LEAD CONNECTOR S2 (SENSE LEAD)
7. 5-PIN ARC LINK S1
8. 5-PIN DEVICENET CONNECTOR S5
9. I / O CONNECTOR
10. NEGATIVE OUTPUT TERMINAL
11. INTERFACE CONNECTOR S6
12. STT TERMINAL
13. POSITIVE OUTPUT TERMINAL
14. AUXILIARY OUTPUT

FIGURE B.1 – POWER WAVE CASE FRONT CONTROLS



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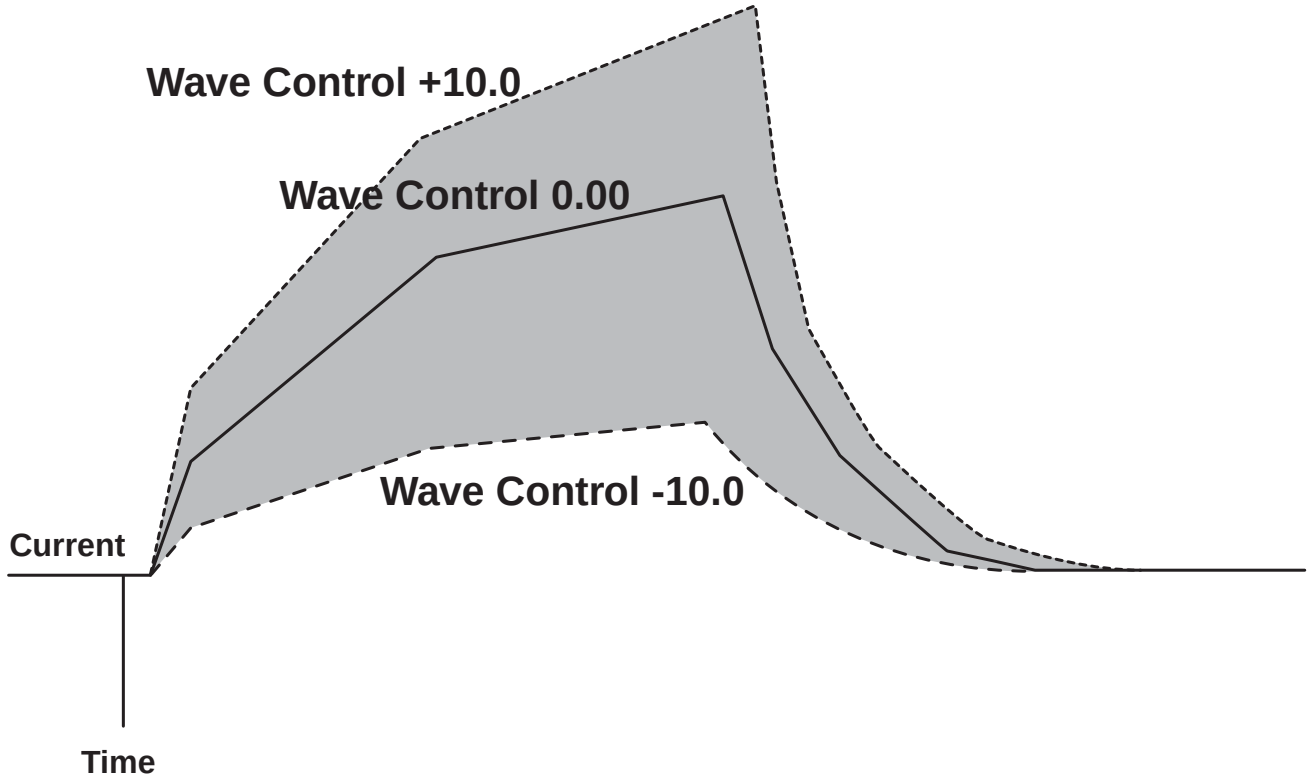
WELDING MODE DESCRIPTIONS

CONSTANT VOLTAGE WELDING

For each wire feed speed, a corresponding voltage is preprogrammed into the machine through special software at the factory. The preprogrammed voltage is the best average voltage for a given wire feed speed. With synergic programs, when the wire feed speed changes, the Power Wave will automatically adjust the corresponding voltage.

Wave control adjusts the inductance of the wave shape. (This adjustment is often referred to as "pinch". Inductance is inversely proportional to pinch.) Increasing wave control greater than 0 results in a harsher, colder arc, while decreasing the wave control to less than 0 provides a softer, hotter arc. (See Figure B.2.)

FIGURE B.2 – CV WAVE CONTROL CHARACTERISTICS



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PULSE WELDING

Pulse welding procedures are set by controlling an overall “arc length” variable. When pulse welding, the arc voltage is highly dependent upon the waveform. The peak current, background current, rise time, fall time and pulse frequency all affect the voltage. The exact voltage for a given wire feed speed can only be predicted when all the pulsing waveform parameters are known. Using a preset voltage becomes impractical, and instead the arc length is set by adjusting “trim.”

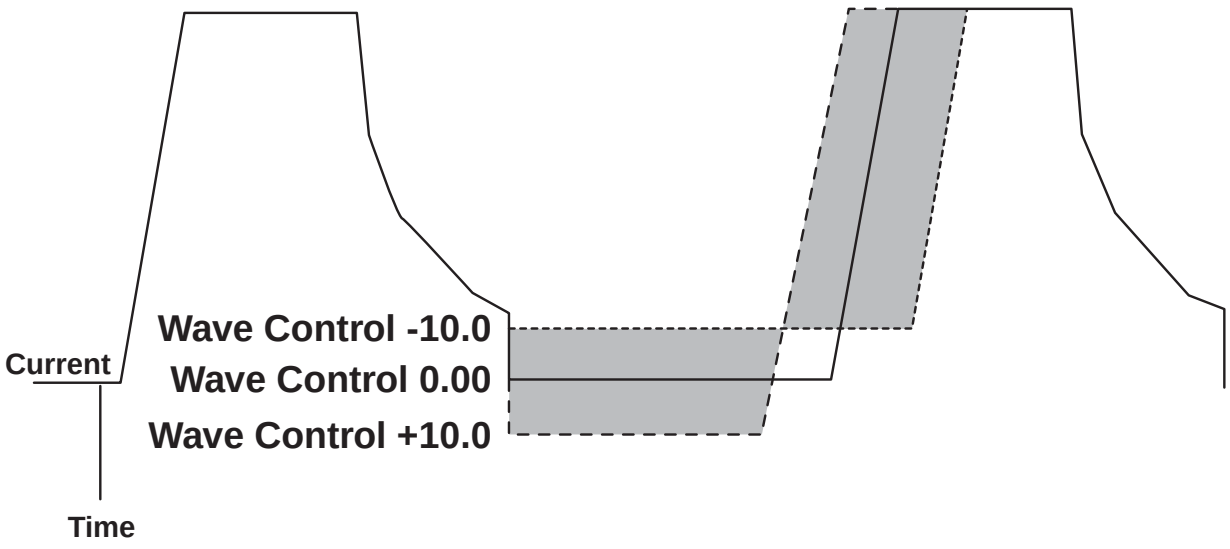
Trim adjusts the arc length and ranges from 0.50 to 1.50, with a nominal value of 1.00. Trim values greater than 1.00 increase the arc length, while values less than 1.00 decrease the arc length.

Most pulse welding programs are synergic. As the wire feed speed is adjusted, the Power Wave will automatically recalculate the waveform parameters to maintain similar arc properties.

The Power Wave utilizes “adaptive control” to compensate for changes in electrical stick-out while welding. (Electrical stick-out is the distance from the contact tip to the work piece.) The Power Wave waveforms are optimized for a 0.75" (19mm) stick-out. The adaptive behavior supports a range of stickouts from 0.50" (13mm) to 1.25" (32mm). At very low or high wire feed speeds, the adaptive range may be less due to reaching the physical limitations of the welding process.

Wave control in pulse programs usually adjusts the focus or shape of the arc. Wave control values greater than 0 increase the pulse frequency while decreasing the background current, resulting in a tight, stiff arc best for high speed sheet metal welding. Wave control values less than 0 decrease the pulse frequency while increasing the background current for a soft arc good for out-of-position welding. (See Figure B.3.)

FIGURE B.3 – PULSE WAVE CONTROL CHARACTERISTICS



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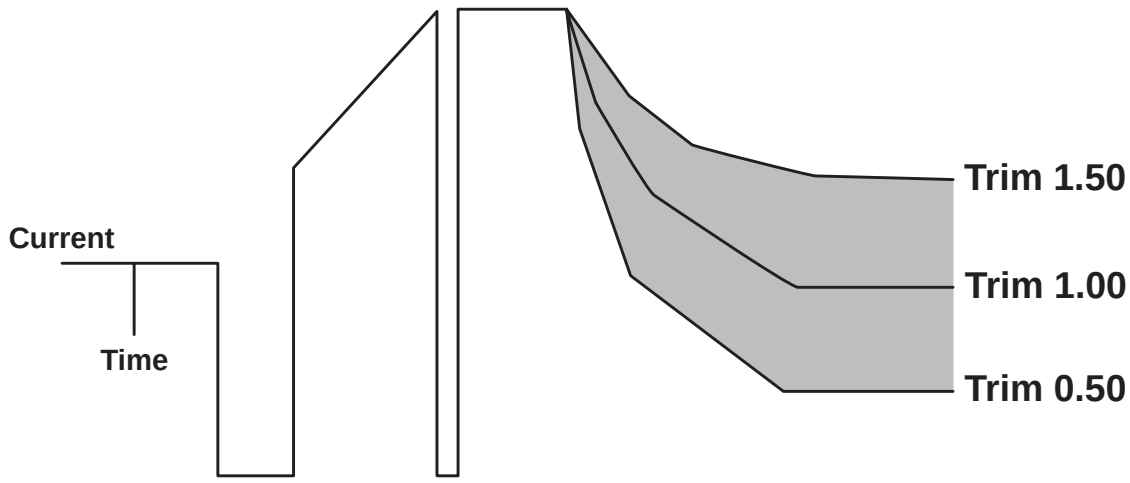
STT WELDING

The pictures illustrate the wave shape of current for the process. They are not drawn to scale, and are intended only for the purpose of showing how the variables affect the waveform.

Trim in the STT mode adjusts the tailout and background portion of the waveform. Trim values greater than 1.0 add more energy to the weld and make the weld puddle hotter; trim values less than 1.0 reduce energy to weld. A nominal value of 1.0 will work for most applications. (See Figure B.4.)

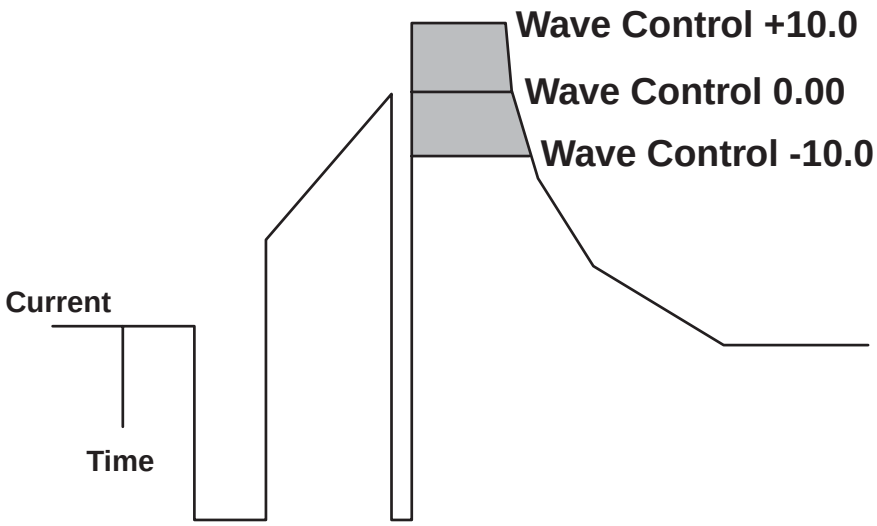
FIGURE B.4 – STT TRIM CONTROL CHARACTERISTICS



For most programs, peak current is adjusted by wave control values. A value of +10.0 maximizes the peak current, while a wave control of -10.0 minimizes peak current. In general, the peak current is proportional to torch arc length. (See Figure B.5.)

NOTE: The ranges on Wave Control and Trim are dependent on the weld programs. The values shown are typical ranges.

FIGURE B.5 – STT WAVE CONTROL CHARACTERISTICS



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OPTIONAL EQUIPMENT

FACTORY INSTALLED

There are no factory installed options available for the Power Wave 455R.

FIELD INSTALLED

- **Gas Guard Regulator (K659-1)**
  The Gas Guard regulator is available as an optional accessory for the Power Feed Robotic wire drive unit. Install the 5/8-18 male outlet on the regulator to the proper 5/8-18 female gas inlet on the back panel of the wire drive. Secure the fitting with the flow adjuster key at the top.
- **Voltage Sense Leads (K940-10, -25 or -50)**
  The voltage sense leads connect at the front of the machine. (See ***Figure A.2.)***
- **Power Wave Water Cooler (K1767-1)***
  The K1767-1 is the recommended water cooler for the Power Wave. Incorporated into the cooler is an automatic flow sensor to detect low coolant flow. In the event of a low flow condition, a fault signal is sent to the Power Wave, and welding output automatically stops to protect the torch.

  The water cooler is designed to cool only one welding gun and should be not used to cool multiple guns or other devices.

  Water cooler manufacturers often specify additives to the coolant such as fungicides or alkalies. Follow the manufacturers' recommendations to achieve proper operation and long lifetime without clogging.
- **Water Flow Sensor (K1536-1)**
  Water cooled guns can be damaged very quickly if they are used even momentarily without water flowing. Recommend practice is to install a water flow sensor such as on the water return line of the torch. When fully integrated into the welding system, the sensor will prevent welding if no water flow is present.
- **Dual Cylinder Undercarriage, K1570-1***
- **Coaxial Welding Cable, K1796**

*The Dual Cylinder Undercarriage, K1570-1, is not compatible in combination with the Power Wave Water Cooler K1767-1.

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SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

- Only Qualified personnel should perform this maintenance.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.
- Do not touch electrically hot parts.

ROUTINE AND PERIODIC MAINTENANCE

1. Disconnect input AC power supply lines to the machine before performing periodic maintenance, tightening, cleaning, or replacing parts. See ***Figure D.1.***

PERFORM THE FOLLOWING DAILY:

1. Check that no combustible materials are in the welding or cutting area or around the machine.
2. Remove any debris, dust, dirt, or materials that could block the air flow to the machine for cooling.
3. Inspect the electrode cables for any slits or punctures in the cable jacket, or any condition that would affect the proper operation of the machine.

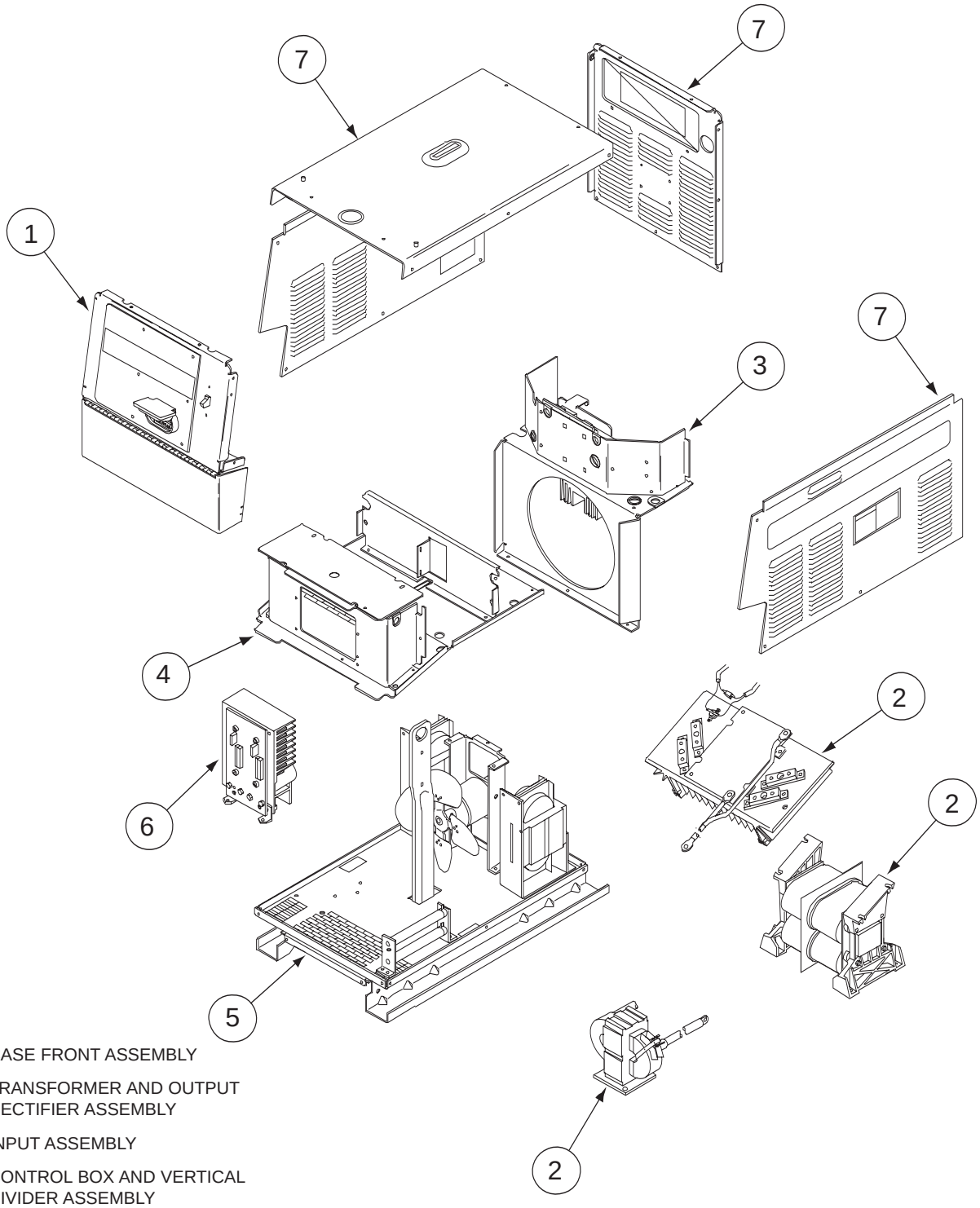
PERFORM PERIODICALLY:

Clean the inside of the machine with a low pressure air stream. Clean the following parts. Refer to ***Figure D.1.***

- Transformer and output rectifier assembly.
- Electrode and work cable connections.
- PC board connections..
- Intake and outlet louvers on the machine case.
- Any obvious accumulations of dirt within the machine.
- Fan Assembly.

NOTE: The fan motor has sealed bearings which require no maintenance.

FIGURE D.1 – MAIN ASSEMBLY (EXPLODED VIEW)



1. CASE FRONT ASSEMBLY
2. TRANSFORMER AND OUTPUT RECTIFIER ASSEMBLY
3. INPUT ASSEMBLY
4. CONTROL BOX AND VERTICAL DIVIDER ASSEMBLY
5. BASE, LIFT BAIL AND FAN ASSEMBLY
6. SWITCH BOARD HEATSINK ASSEMBLY
7. CASE PARTS

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Section E-1

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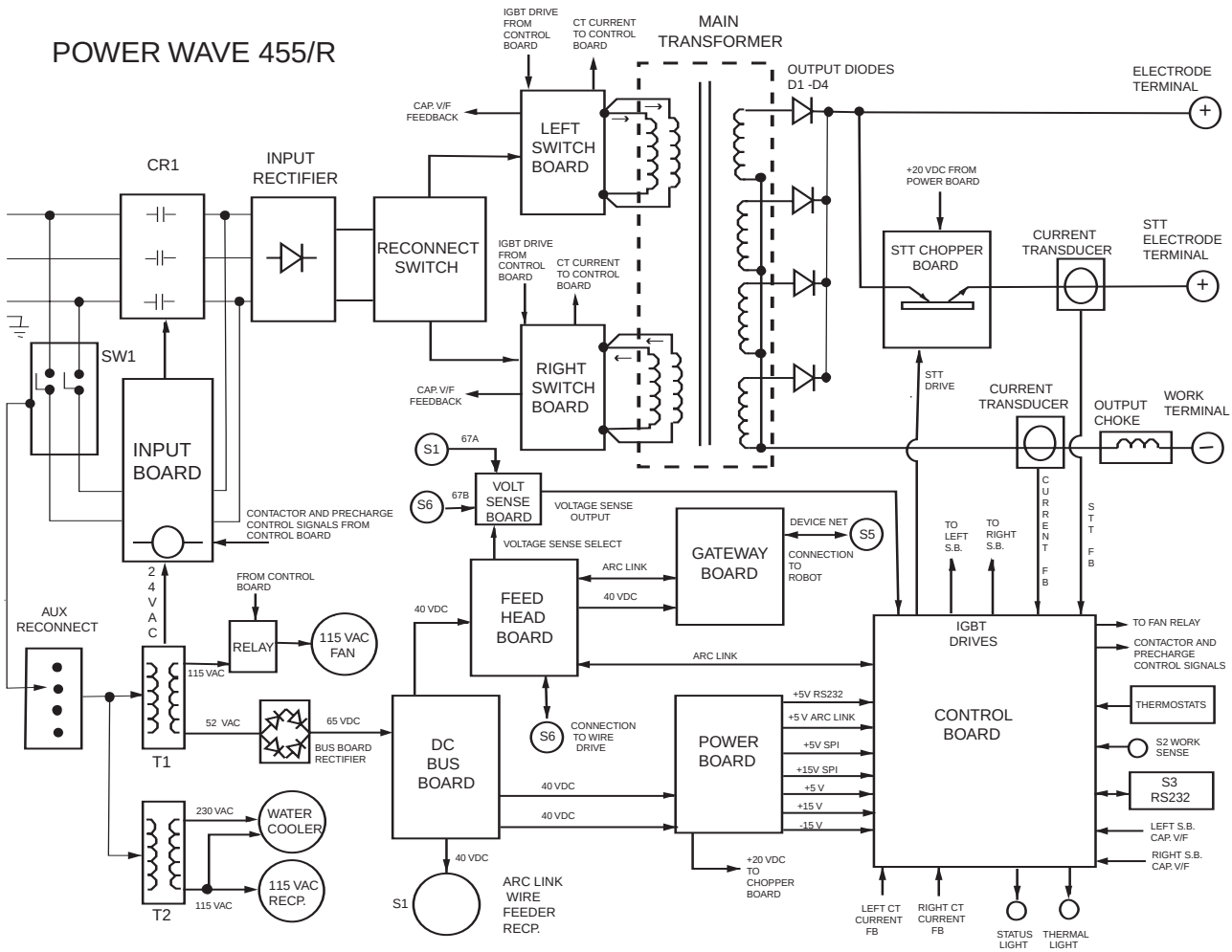
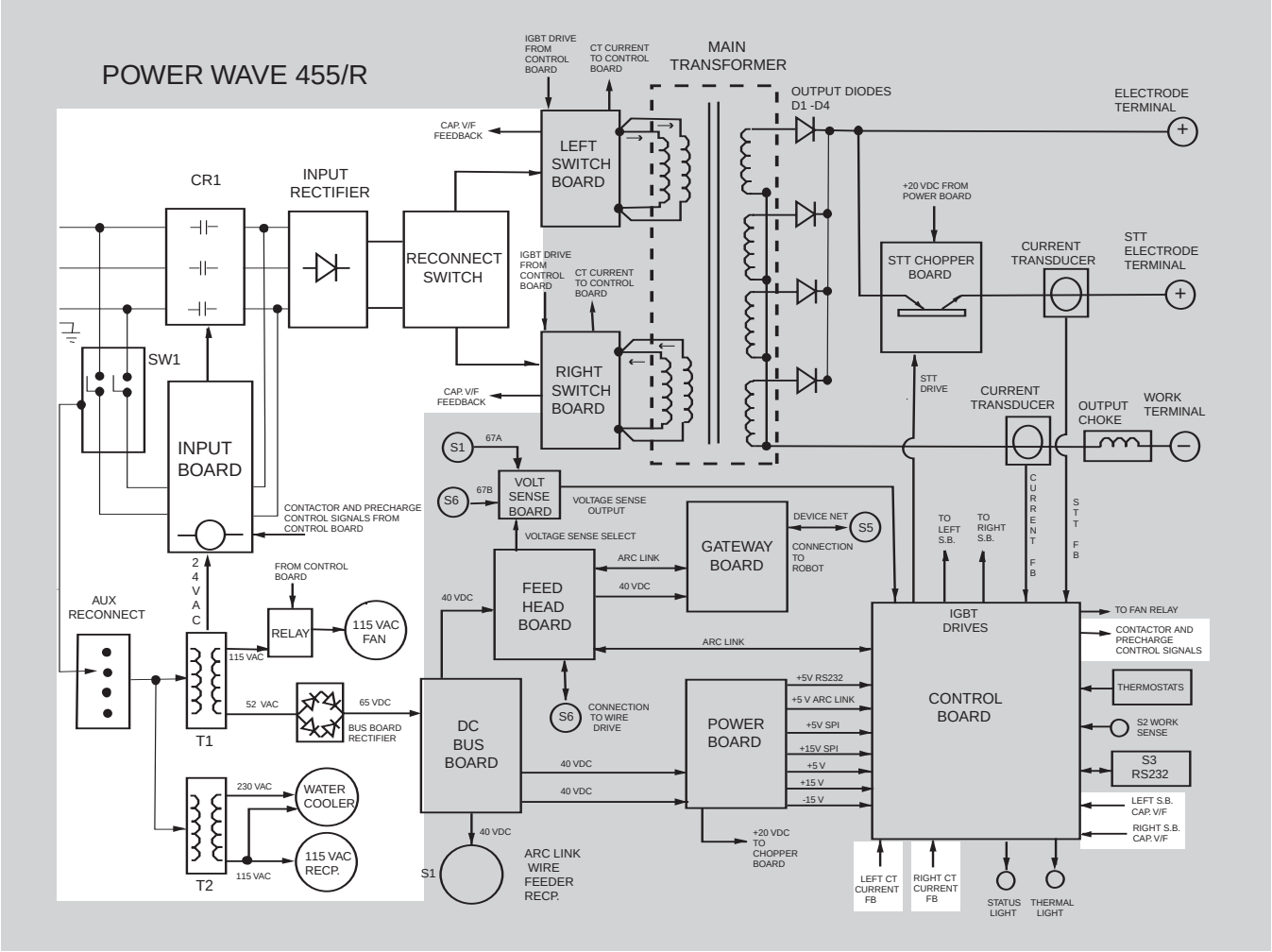
FIGURE E.1 – BLOCK LOGIC DIAGRAM



POWER WAVE 455M/MSTT

FIGURE E.2 – INPUT VOLTAGE AND PRECHARGE



GENERAL DESCRIPTION

The Power Wave 455M/MSTT power source is designed to be a part of a modular, multi-process welding system. It is a high performance, digitally controlled inverter welding power source capable of complex, high-speed waveform control. Depending upon configuration, it can support constant current, constant voltage, surface tension transfer and pulse welding modes. Each machine is factory preprogrammed with multiple welding procedures. Typically these procedures include GMAW, GMAW-P, FCAW, GTAW and STT (Surface Tension Transfer) for a variety of materials such as mild steel, stainless steel, cored wires and aluminum. The STT process supports mild steel and stainless steel welding. PW455M/STT only.

The Power Wave 455M/STT has an output rating of either 450 amps at 38 volts or 400 amps at 36 volts. The two output ratings are dependent upon input voltage and frequency. Both have a duty cycle of 100%. The STT process is rated at currents up to 325 amps at a 100% duty cycle.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

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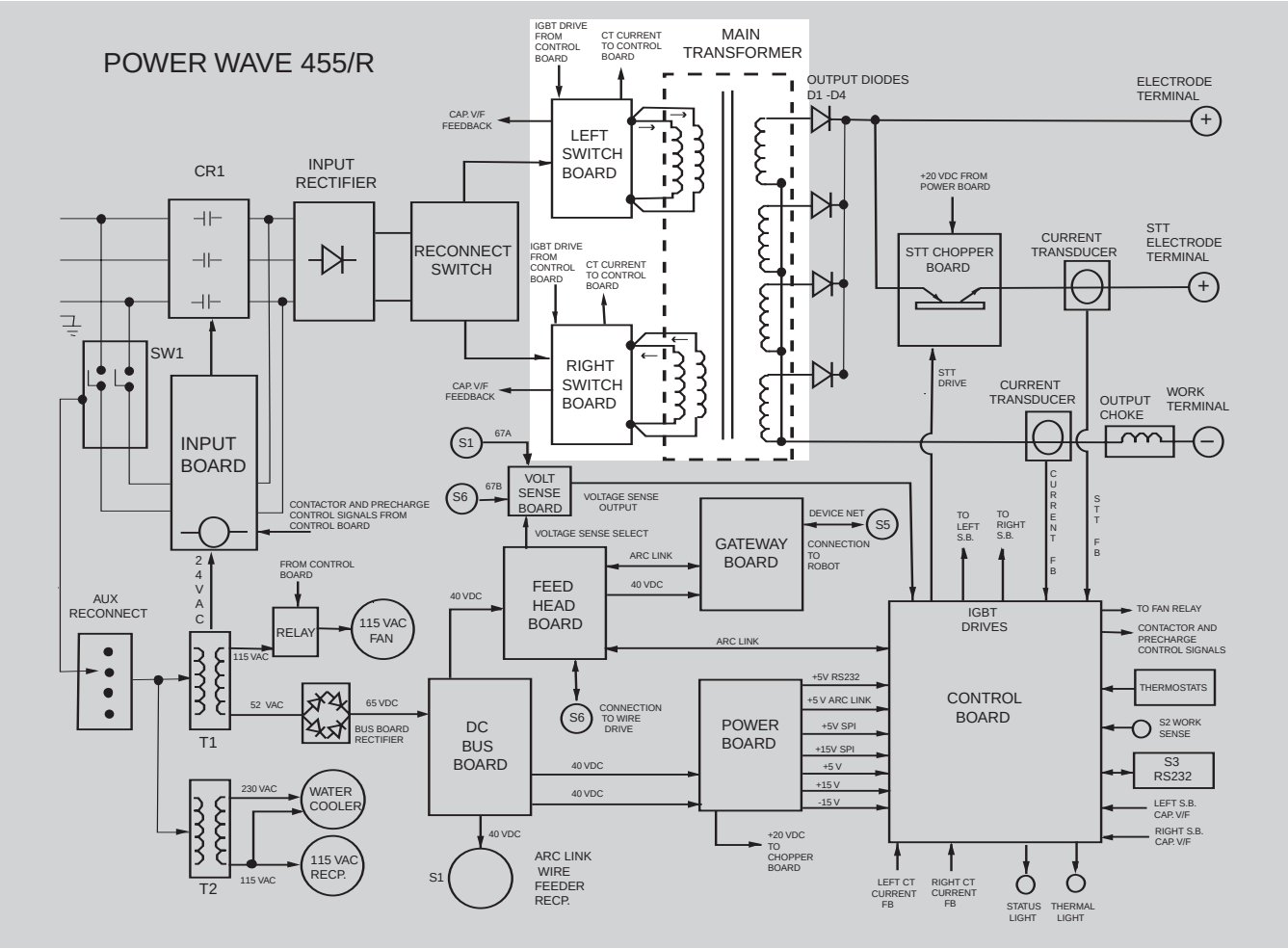
INPUT VOLTAGE AND PRECHARGE

The Power Wave 455M can be connected for a variety of three-phase input voltages. Refer to Figure E.2. The initial input power is applied to the Power Wave 455M through a line switch located on the front of the machine. Two phases of the three-phase input power are applied to the Input Board and both auxiliary transformers. The various secondary voltages developed by transformer T1 are applied to the Input Board, the fan motor (via a control relay) and the Bus Board rectifier. The 65VDC produced from the Bus Board rectifier is used by the Bus Board to provide various DC voltages for the Power Board, the Feed Head Board and the wire feeder receptacle. The 115/230VAC developed on the secondary of auxiliary transformer T2 is applied to the 115VAC receptacle and to the water cooler receptacle.

The two phases that are connected to the Input Board, through the input line switch SW1, are connected to the input rectifier through the CR1 precharge relay. During the precharge or "soft start" sequence, these two phases are current limited by the Input Board. The AC input voltage is rectified, and the resultant DC voltage is applied through the reconnect switches to the input capacitors located on the right and left switch boards. The Control Board monitors the voltage across the capacitors. When the capacitors have charged to an acceptable level, the Control Board signals the Input Board to energize the main input contactor, making all three phases of input power, without current limiting, available to the input capacitors. At this point the Power Wave 455M is in the "Run Mode" of operation. If the capacitors become undervoltaged, overvoltaged, or unbalanced, the Control Board will signal the Input Board to de-energize the main input contactor, and the Power Wave 455M will be disabled. See ***Figure E.2.***

FIGURE E.3 - SWITCH BOARDS AND MAIN TRANSFORMER



SWITCH BOARDS AND MAIN TRANSFORMER

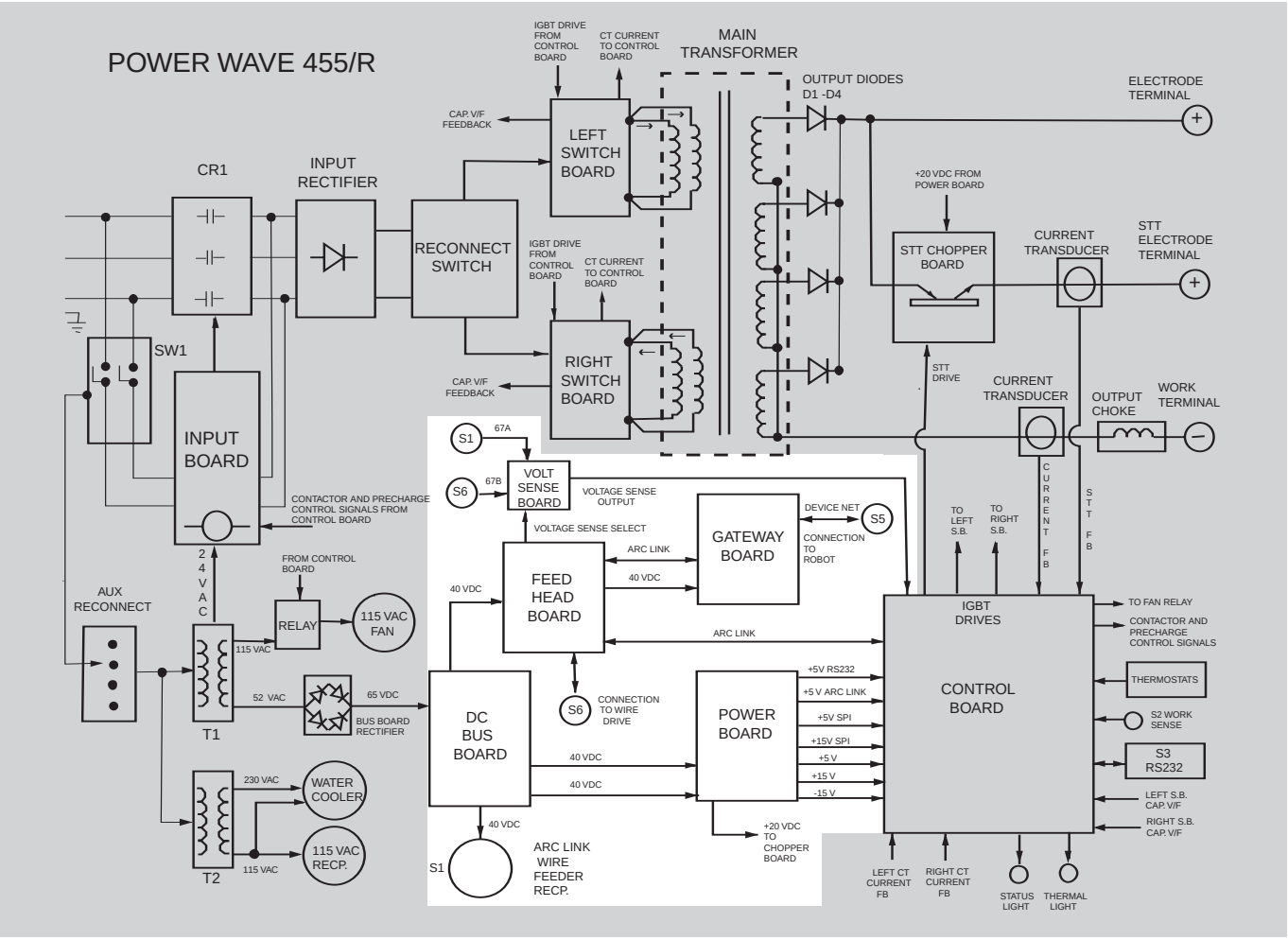
There are two switch boards in the Power Wave 455M machine. Each contains an input capacitor and insulated gate bipolar transistor (IGBT) switching circuitry. Refer to Figure E.3. When the machine reconnect switches are configured for a lower input voltage (below 300VAC), the input capacitors are connected in parallel. When the machine is configured for higher input voltages (300VAC and above), the input capacitors are connected in series.

When the input capacitors are fully charged, they act as power supplies for the IGBT switching circuits. The insulated gate bipolar transistors switch the DC power from the input capacitors "on and off," thus supplying pulsed DC current to the main transformer primary windings. See ***IGBT OPERATION DISCUSSION AND DIAGRAMS*** in this section.

Each switch board feeds current to a separate, oppositely wound primary winding in the Main Transformer. The reverse directions of current flow through the main transformer primaries, and the offset timing of the IGBT switch boards induce an AC square wave output signal at the secondary of the main transformer. Current transformers located on the switch boards monitor the primary currents. If the primary currents become abnormally high, the Control Board will shut off the IGBTs, thus disabling the machine's output. The firing of the two switch boards occurs during halves of a 50-microsecond interval, creating a constant 20 KHZ output.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

FIGURE E-4 – DC BUS BOARD, POWER BOARD, FEED HEAD BOARD, GATEWAY BOARD AND VOLTAGE SENSE BOARD



DC BUS BOARD, POWER BOARD, AND GATEWAY BOARD

The DC Bus Board receives approximately 65VDC from the Bus Board rectifier. The DC Bus Board regulates that 65VDC to a +40VDC supply. This regulated 40VDC is applied to the Feed Head Board, the Power Board, and the wire feeder receptacle.

The switching power supplies on the Power Board supply a variety of regulated DC voltages to the Control Board and a +20VDC to the STT Chopper Board. The Control Board uses these regulated voltages to power the many circuits and communication functions incorporated within the Control Board.

When the Feed Head Board activates the Voltage Sense Board, the actual arc voltage is sensed (lead 67), and this information is delivered through the voltage sense board to the Control Board.

The Power Wave 455M uses two digital communication platforms. Internally the PC boards communicate via ArcLink. Externally the Power Wave 455R communicates using the industry standard Device Net protocols. The Gateway Board makes the translation between the two platforms possible. The Power Wave 455R does not have a dedicated interface device or board. The robot (or other input device – PLC, etc.) acts as the user interface, issuing commands through the Device Net protocol that are translated by the Gateway Board to ArcLink compatible messages. The following block diagram ***(Figure E.5)*** depicts the flow of communication information.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

FIGURE E.5 – POWER WAVE 455/R COMMUNICATIONS

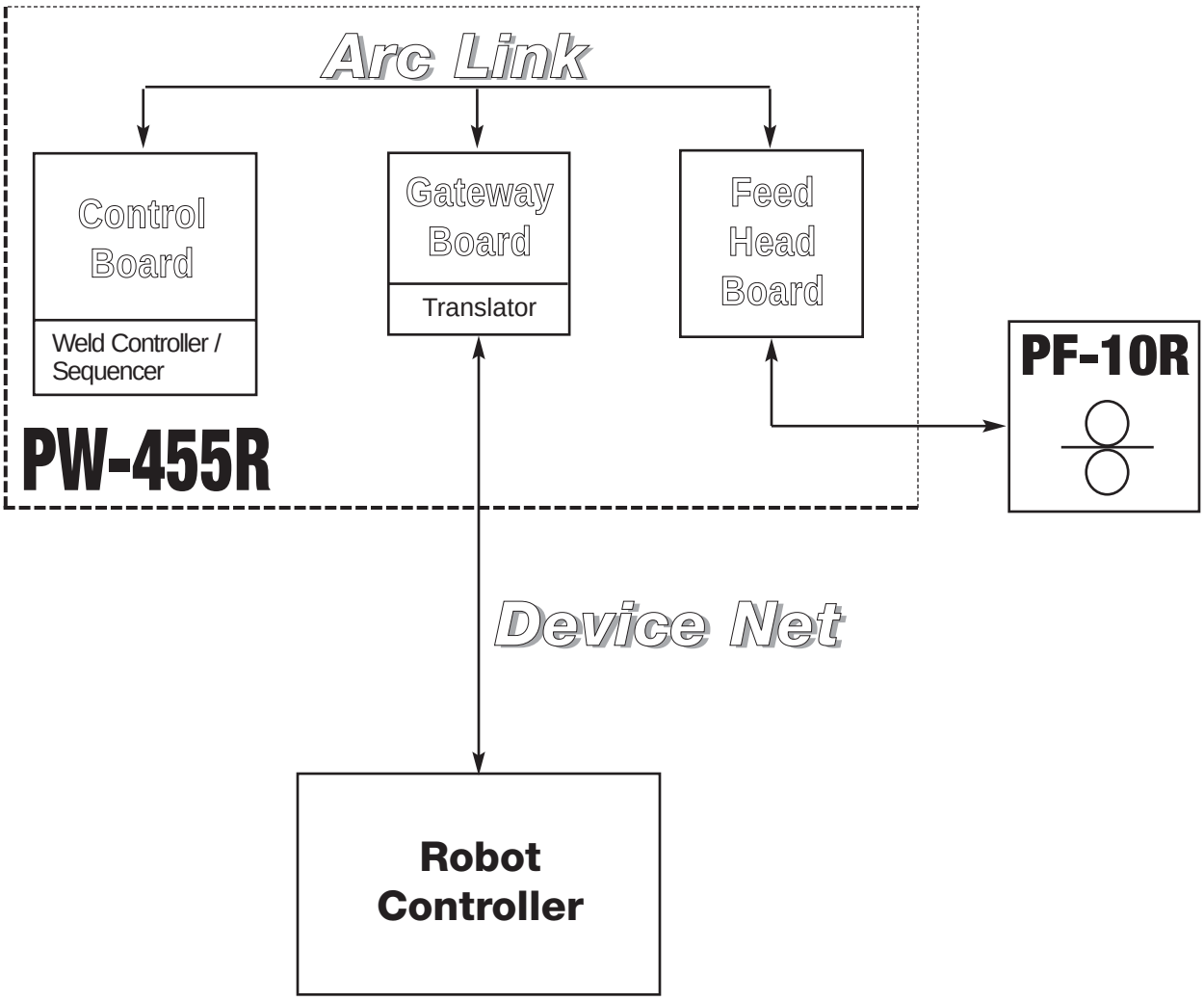


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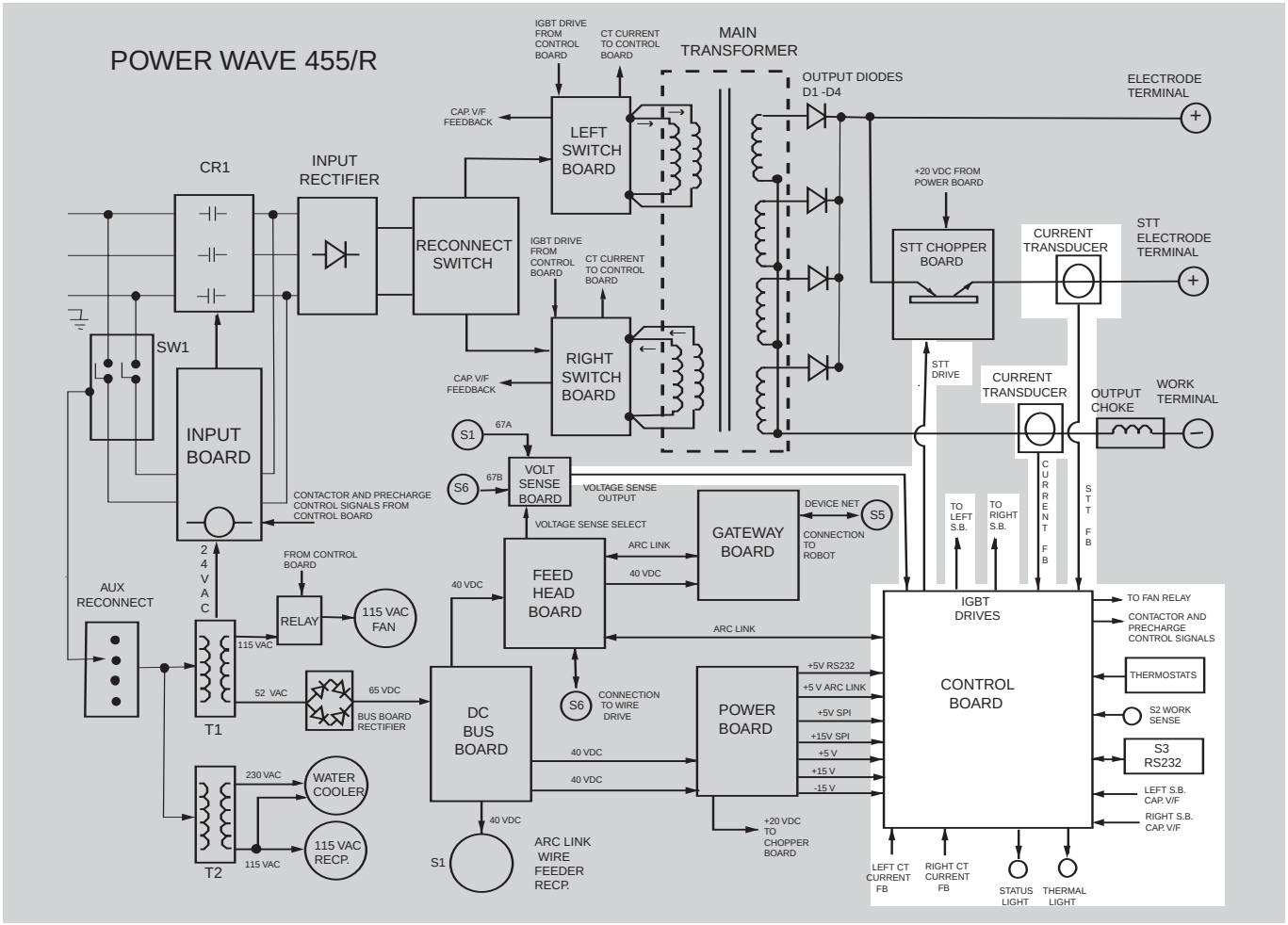
FIGURE E.6 – CONTROL BOARD



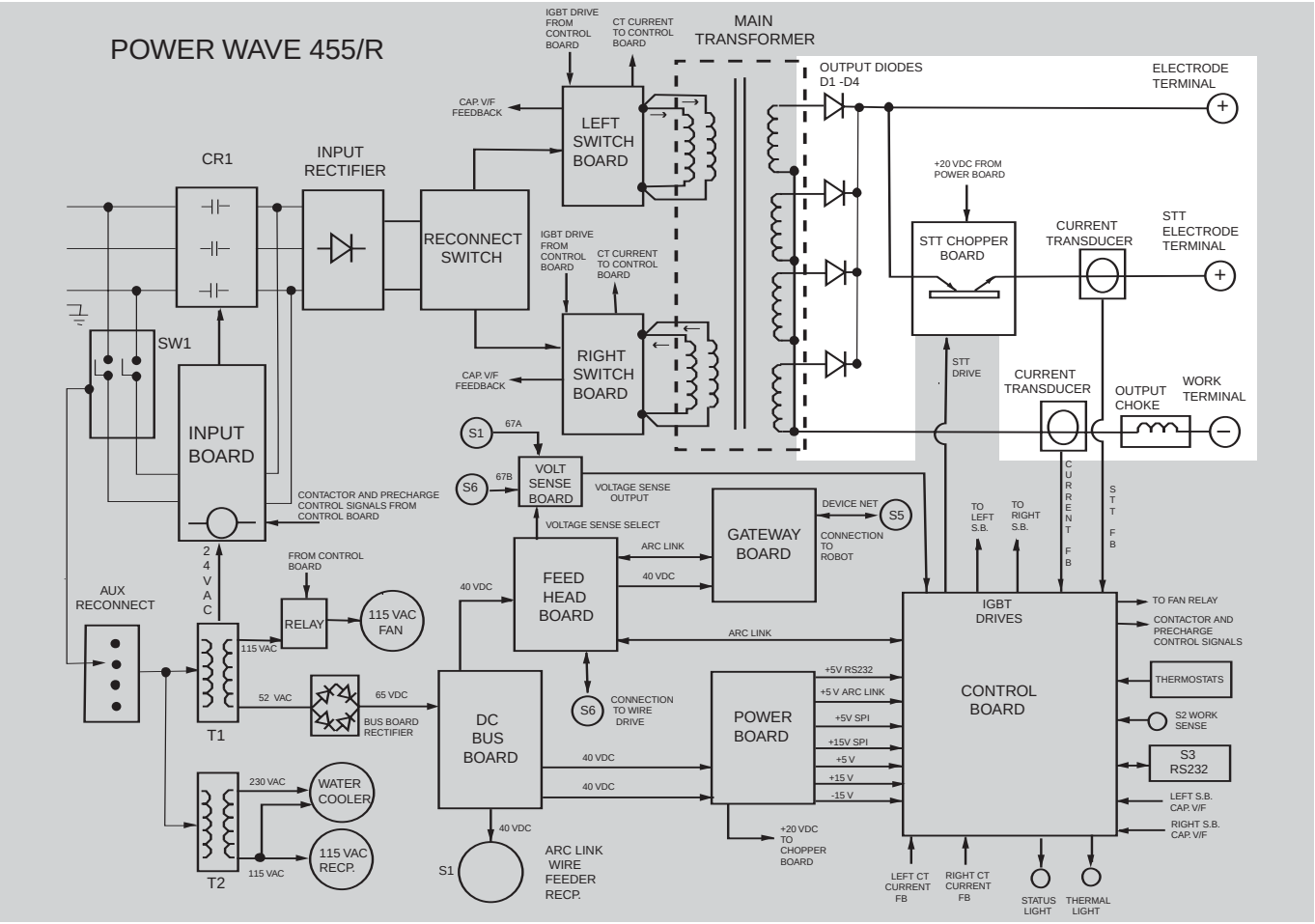
CONTROL BOARD

The Control Board performs the primary interfacing functions to establish and maintain output control of the Power Wave 455R machine. The function generator and weld files exist within the Control Board hardware and software. Digital command signals and feedback information is received and processed at the Control Board. Software within the Control Board processes the command and feedback information and sends the appropriate pulse width modulation (PWM) signals (see ***PULSE WIDTH MODULATION*** in this section) to the switch board IGBTs. In this manner, the digitally controlled high-speed welding waveform is created.

The Control Board also monitors and controls the STT (Surface Tension Transfer) circuitry incorporated in the Power Wave 455R. STT output currents and arc voltages are monitored, and the appropriated gate firing signals are applied (or removed) from the STT Chopper Board and switch boards to create a low spatter, low fume MIG welding process. See ***GENERAL DESCRIPTION OF STT (SURFACE TENSION TRANSFER PROCESS)*** in this section.

In addition, the Control Board monitors the thermostats, the main transformer primary currents and input filter capacitor voltages. Depending on the fault condition, the Control Board will activate the thermal and/or the status light and will disable or reduce the machine output. In some conditions the input contactor will be de-energized.

FIGURE E.7 – OUTPUT RECTIFIER, OUTPUT CHOKE AND STT CHOPPER BOARD



OUTPUT RECTIFIER AND CHOKE

The output rectifier receives the AC output from the main transformer secondary and rectifies it to a DC voltage level. Since the outuput choke is in series with the negative leg of hte output rectifier and also in series with the welding load, a filtered DC output is applied to the machine output terminals. Refer to *Figure E.7.*

When in the STT mode, the control circuit monitors the voltage conditions at the arc, and turns the STT chopper module on or of as necessary to generate an STT output waveform. The STT current transducer in the STT circuit signals the control board to limit output to 375 amps maximum.

THEORY OF OPERATION

THERMAL PROTECTION

Three normally closed (NC) thermostats protect the machine from excessive operating temperatures. These thermostats are wired in series and are connected to the control board. One of the thermostats is located on the heat sink of the output rectifier, one on the DC bus, and one on the output choke. Excessive temperatures may be caused by a lack of cooling air or by operating the machine beyond its duty cycle or output rating. If excessive operating temperatures should occur, the thermostats will prevent output from the machine. The yellow thermal light, located on the front of the machine, will be illuminated. The thermostats are self-resetting once the machine cools sufficiently. If the thermostat shutdown was caused by excessive output or duty cycle and the fan is operating normally, the power switch may be left on and the reset should occur within a 15-minute period. If the fan is not turning or the intake air louvers are obstructed, the power must be removed from the machine and the fan condition or air obstruction corrected. On later production machines (above code 10500) the cooling fan runs only when necessary. The F.A.N. (fan as needed) system is controlled by the Control Board via a solid state relay.

PROTECTIVE CIRCUITS

Protective circuits are designed into the Power Wave 455/R to sense trouble and shut down the machine before damage occurs to the machine's internal components.

OVER CURRENT PROTECTION

If the average current exceeds 570 amps, the peak current will be limited to 100 amps until the average current decreases to under 50 amps or the system is re-triggered.

UNDER/OVER VOLTAGE PROTECTION

A protective circuit is included on the Control Board to monitor the voltage across the input capacitors. In the event that a capacitor voltage is too high, too low, or becomes unbalanced side-to-side, the protection circuit will de-energize the input contactor. Machine output will be disabled, and the "soft start" mode will be repeated. The protection circuit will prevent output if any of the following circumstances occur.

1. Capacitor conditioning is required. (This may be required if the machine has been off for a long period of time and is connected for high input voltage operation.)
2. Voltage across a capacitor exceeds 390 volts. (This could result from high line surges or improper input voltage connections.)
3. Voltage across a capacitor is under 70 volts. (This would be due to improper input voltage connections.)
4. Internal component damage.

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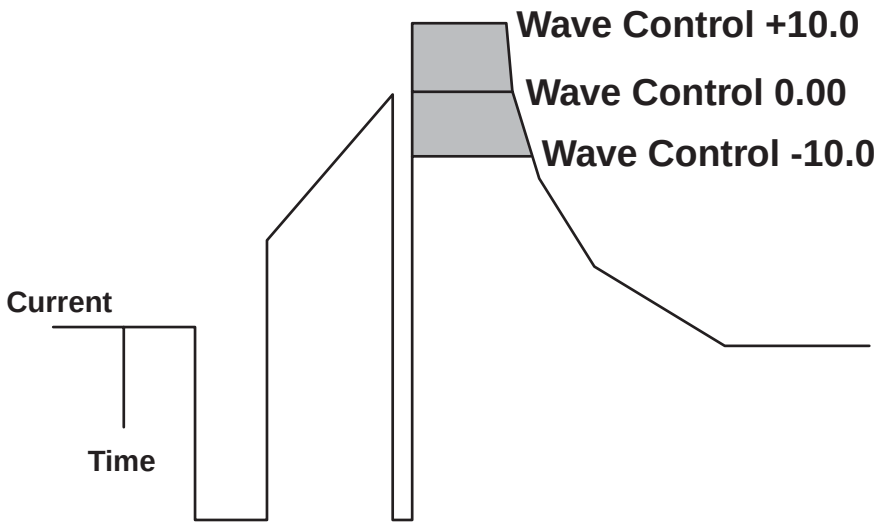
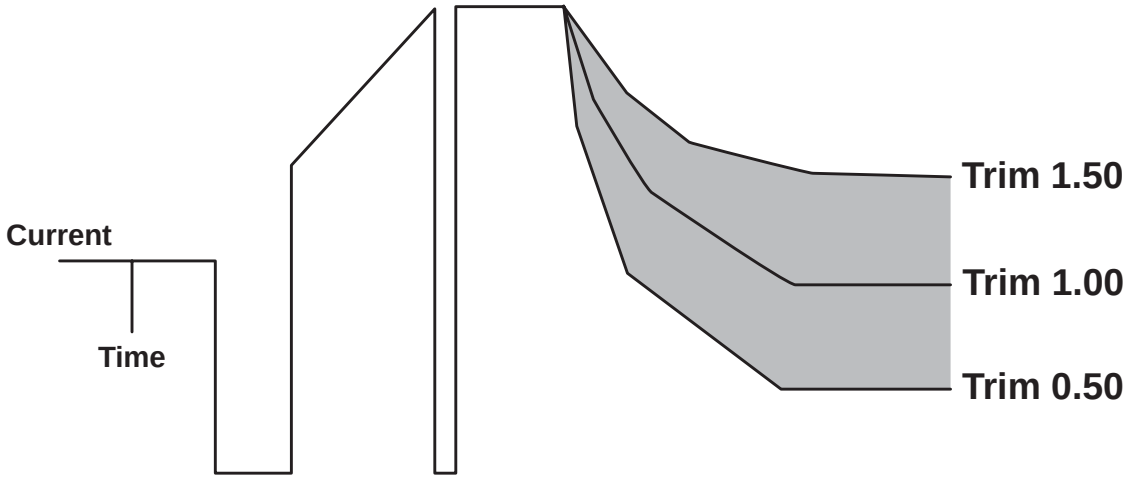
FIGURE E.8 – STT WAVEFORMS



STT Wave control characteristics

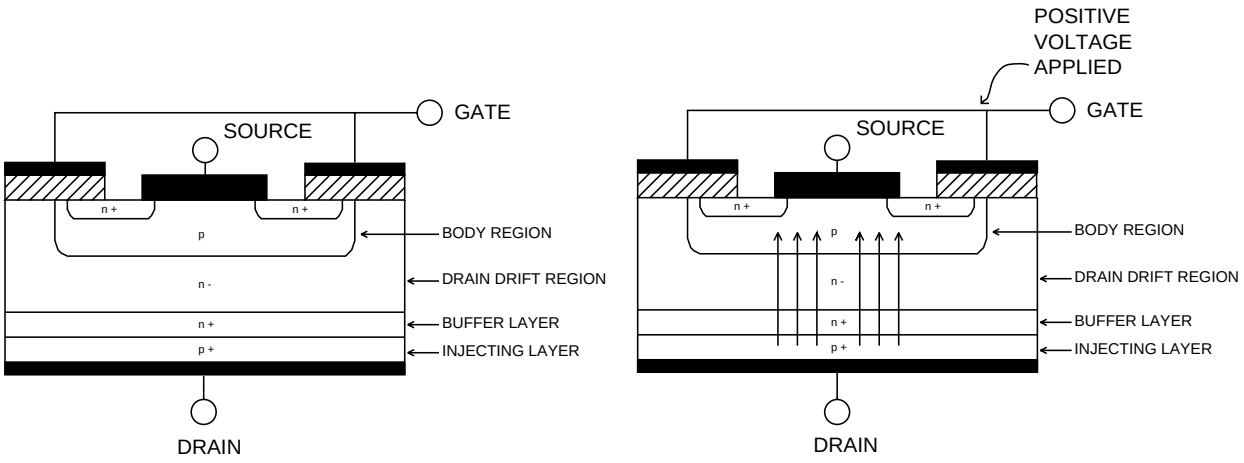


STT Trim control characteristics

GENERAL DESCRIPTION OF THE STT (SURFACE TENSION TRANSFER) PROCESS

The STT process cannot be classified as either a constant current (CC) or a constant voltage (CV) application. The STT function produces current of a desired waveform to reduce spatter and fumes. The STT process is optimized for short-circuit GMAW welding only.

FIGURE E.9 – IGBT OPERATION



INSULATED GATE BIPOLAR TRANSISTOR (IGBT) OPERATION

An IGBT is a type of transistor. IGBTs are semiconductors well suited for high frequency switching and high current applications.

Drawing A shows an IGBT in a passive mode. There is no gate signal, zero volts relative to the source, and therefore, no current flow. The drain terminal of the IGBT may be connected to a voltage supply; but since there is no conduction, the circuit will not supply current to components connected to the source. The circuit is turned off like a light switch in the OFF position.

Drawing B shows the IGBT in an active mode. When the gate signal, a positive DC voltage relative to the source, is applied to the gate terminal of the IGBT, it is capable of conducting current. A voltage supply connected to the drain terminal will allow the IGBT to conduct and supply current to circuit components coupled to the source. Current will flow through the conducting IGBT to downstream components as long as the positive gate signal is present. This is similar to turning ON a light switch.

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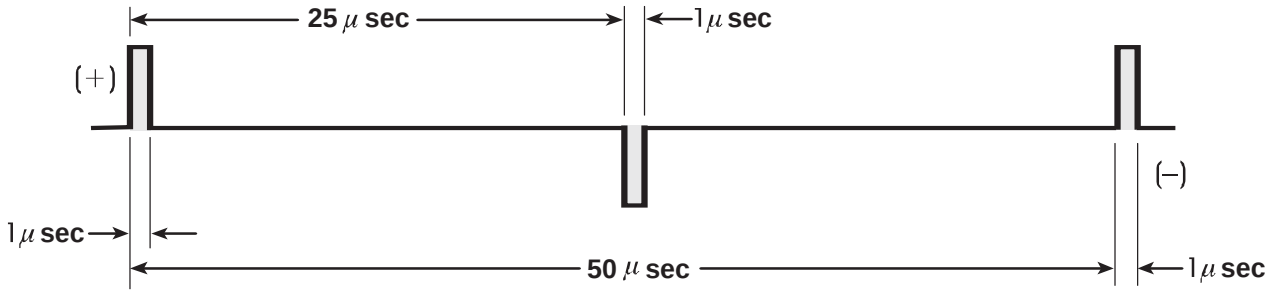
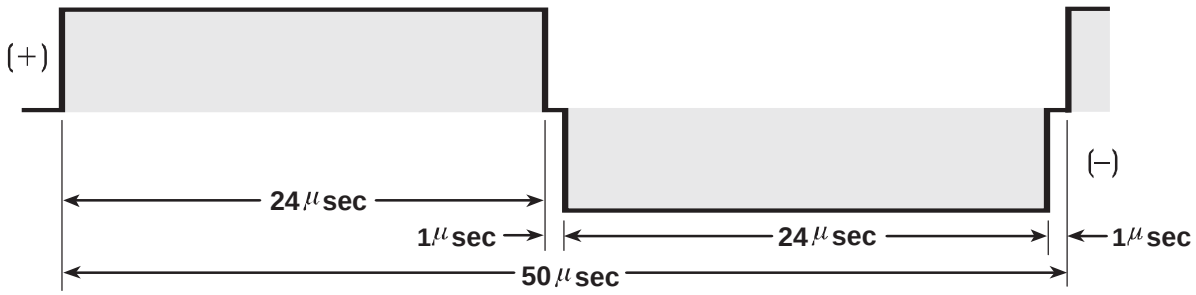
FIGURE E.10 – TYPICAL IGBT OUTPUTS



MINIMUM OUTPUT



MAXIMUM OUTPUT

PULSE WIDTH MODULATION

The term PULSE WIDTH MODULATION (PWM) is used to describe how much time is devoted to conduction in the positive and negative portions of the cycle. Changing the pulse width is known as MODULATION. Pulse Width Modulation is the varying of the pulse width over the allowed range of a cycle to affect the output of the machine.

MINIMUM OUTPUT

By controlling the duration of the gate signal, the IGBT is turned on and off for different durations during a cycle. The top drawing below shows the minimum output signal possible over a 50-microsecond time period.

The shaded portion of the signal represents one IGBT group[1], conducting for 1 microsecond. The negative portion is the other IGBT group. The dwell time (off time) is 48 microseconds (both IGBT groups off). Since only 2 microseconds of the 50-microsecond time period are devoted to conducting, the output power is minimized.

MAXIMUM OUTPUT

By holding the gate signals on for 24 microseconds each and allowing only 2 microseconds of dwell or off time (one microsecond during each half cycle) during the 50 microsecond cycle, the output is maximized. The darkened area under the minimum output curve can be compared to the area under the maximum output curve. The more darkened area, the more power is present.

[1] An IGBT group consists of the sets of IGBT modules grouped onto one switch board.

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TROUBLESHOOTING & REPAIR

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HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

Service and repair should be performed by only Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

Step 1. LOCATE PROBLEM (SYMPTOM). Look under the column labeled "PROBLEM" (SYMPTOMS). This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into two main categories: Output Problems and Function Problems.

Step 2. PERFORM EXTERNAL TESTS. The second column, labeled "POSSIBLE AREAS OF MISADJUSTMENT(S)", lists the obvious external possibilities that may contribute to the machine symptom. Perform these tests/checks in the order listed. In general, these tests can be conducted without removing the case cover.

Step 3. PERFORM COMPONENT TESTS. The last column, labeled "Recommended Course of Action" lists the most likely components that may have failed in your machine. It also specifies the appropriate test procedure to verify that the subject component is either good or bad. If there are a number of possible components, check the components in the order listed to eliminate one possibility at a time until you locate the cause of your problem.

All of the referenced test procedures referred to in the Troubleshooting Guide are described in detail at the end of this section. Refer to the Troubleshooting and Repair Table of Contents to locate each specific Test Procedure. All of the referred to test points, components, terminal strips, etc., can be found on the referenced electrical wiring diagrams and schematics. Refer to the Electrical Diagrams Section Table of Contents to locate the appropriate diagram.

In addition to the troubleshooting information in this manual, Lincoln Electric offers a System Update Utility to reprogram digital power sources. The utility will examine the welding system allowing you to upgrade to the current release of the operating system software and welding programs available for the machine if necessary. This software can be reviewed and downloaded from powerwavesoftware.com or from mylincolnelectric.com. Download and review the entire user manual before attempting to use the software.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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PC BOARD TROUBLESHOOTING PROCEDURES

⚠ WARNING

ELECTRIC SHOCK can kill.

Have an electrician install and service this equipment. Turn the machine OFF before working on equipment. Do not touch electrically hot parts.

Sometimes machine failures appear to be due to PC board failures. These problems can sometimes be traced to poor electrical connections. To avoid problems when troubleshooting and replacing PC boards, please use the following procedure:

1. Determine to the best of your technical ability that the PC board is the most likely component causing the failure symptom.
2. Check for loose connections at the PC board to assure that the PC board is properly connected.
3. If the problem persists, replace the suspect PC board using standard practices to avoid static electrical damage and electrical shock. Read the warning inside the static resistant bag and perform the following procedures:

ATTENTION
Static-Sensitive Devices
Handle only at Static-Safe Workstations

PC Board can be damaged by static electricity.

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.
- If you don't have a wrist strap, touch an unpainted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.
- Tools which come in contact with the PC Board must be either conductive, anti-static or static-dissipative.
- Remove the PC Board from the static-shielding bag and place it directly into the equipment. Don't set the PC Board on or near paper, plastic or cloth which could have a static charge. If the PC Board can't be installed immediately, put it back in the static-shielding bag.
- If the PC Board uses protective shorting jumpers, don't remove them until installation is complete.
- If you return a PC Board to The Lincoln Electric Company for credit, it must be in the static-shielding bag. This will prevent further damage and allow proper failure analysis.

4. Test the machine to determine if the failure symptom has been corrected by the replacement PC board.

NOTE: Allow the machine to heat up so that all electrical components can reach their operating temperature.

5. Remove the replacement PC board and substitute it with the original PC board to recreate the original problem.
   a. If the original problem does not reappear by substituting the original board, then the PC board was not the problem. Continue to look for bad connections in the control wiring harness, junction blocks, and terminal strips.
   b. If the original problem is recreated by the substitution of the original board, then the PC board was the problem. Reinstall the replacement PC board and test the machine.
6. Always indicate that this procedure was followed when warranty reports are to be submitted.

NOTE: Following this procedure and writing on the warranty report, "INSTALLED AND SWITCHED PC BOARDS TO VERIFY PROBLEM," will help avoid denial of legitimate PC board warranty claims.

TROUBLESHOOTING & REPAIR

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The input fuses repeatedly fail or the input circuit breakers keep tripping.	1. Make certain the fuses or breakers are properly sized. 2. Make certain the reconnect panel is configured properly for the applied voltage. 3. The welding procedure may be drawing too much input current or the duty cycle may be too high. Reduce the welding current and /or reduce the duty cycle.	1. Check the reconnect switches and associated wiring. See the Wiring Diagram. 2. Perform the ***Input Rectifier Test.*** 3. Perform the ***Switch Board Test.*** 4. Perform the ***Input Contactor Test.***

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TROUBLESHOOTING & REPAIR

TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The machine is dead—no lights—no output—the machine appears to be off.	1. Make certain the input power switch SW1 is in the ON position. 2. Check the main input fuses (or breakers). If open, replace or reset. 3. Check the 6 amp CB4 breaker located in the reconnect area. Reset if tripped. 4. Make certain the reconnect panel is configured correctly for the applied input voltage.	1. Check the input power switch SW1 for proper operation. Also check the associated leads for loose or faulty connections. See the Wiring Diagram. 2. Check circuit breaker CB4 for proper operation. 3. Perform the ***DC Bus Board Test.*** 4. The power board rectifier may be faulty. Check rectifier and associated wiring. See the Wiring Diagram 5. Perform the ***Power Board Test.*** 6. Perform the ***T1 Auxiliary Transformer Test.*** 7. The Control Board may be faulty.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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TROUBLESHOOTING & REPAIR

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The Power Wave 455M does not have welding output. The main input contactor CR1 is not activating. Fan may be running.	1. Turn the input power off and make certain the reconnect panel is configured correctly for the applied input voltage. 2. If the Thermal light is lit, See next.	1. Check status led on case front evaluate 2. Perform the ***Input Contactor Test.*** 3. Perform the ***Input Board Test.*** 4. Perform the ***T1 Auxiliary Transformer Test.*** 5. Perform the ***Input Rectifier Test.*** 6. Perform the ***Switch Board Test.*** 7. Perform the ***Power Board Test.*** 8. The Control Board may be faulty.
The thermal light is lit. The machine regularly "overheats."	1. The welding application may be exceeding the recommended duty cycle and/or current limits of the machine. 2. Dirt and dust may have clogged the cooling channels inside the machine. Refer to the ***Maintenance Section*** of this manual. 3. Air intake and exhaust louvers may be blocked due to inadequate clearance around the machine. 4. Make sure the fan is functioning correctly. Machines above code 10500 are equipped with F.A.N. (fan as needed) circuitry. The fan runs whenever the output is enabled, whether under load or open circuit conditions. The fan also runs for a period of time (approximately 5 minutes) after the output is disabled.	1. One of the thermostats may be faulty. Also check associated wiring for loose or faulty connections. See the Wiring Diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TROUBLESHOOTING & REPAIR

TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The machine often "noodle welds" when running a particular process. The output is limited to approximately 100 amps.	1. The machine may be trying to deliver too much power. When the average output current exceeds 570 amps, the machine will "phase back" to protect itself. Adjust the procedure or reduce the load to lower the current draw from the Power Wave 455R machine.	1. Perform the ***Current Transducer Test.*** 2. The Control Board may be faulty.
The machine often "noodle welds" when running an STT process.	STT work/ Electrode sense lead routing	1. Refer to sense lead route recommendations section 2. Perform the ***Current Transducer Test.***
The Power Wave 455R will not produce full output.	1. The input voltage may be too low, limiting the output capability of the machine. Make certain the input voltage is correct for the machine and the reconnect panel configuration. 2. Make sure all three phases of input power are being applied to the machine. 3. If using the STT output terminal, be aware that the STT output is limited to 325 amps.	1. Perform the ***Output Rectifier Test.*** 2. Perform the ***Current Transducer Test.*** 3. Perform the ***Power Board Test.*** 4. The Control Board may be faulty. 5. If using the STT output terminal, the STT Chopper Board may be faulty. See the Wiring Diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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TROUBLESHOOTING & REPAIR

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The Auxiliary Receptacle is "dead." The 120VAC is not present at the receptacle.	1. Check the 3.5 amp circuit breaker (CB3) located in the reconnect area. Reset if necessary.	1. Check the receptacle and associated wiring for loose or faulty connections. See the Wiring Diagram. 2. Perform the ***T2 Auxiliary Transformer Test.***
The Power Wave 455M is "triggered" for output but there is no welding output.	1. Make sure that the triggering method and device is correct and operating properly.	Use troubleshooting software to find the problem. Refer to L.E. setup utility user manual section.
When in the STT mode, the spatter is higher than normal and the arc is inconsistent.	1. Make certain the work sense lead (21) is connected properly. 2. Make certain the electrode cable is connected only to the STT output terminal and NOT the Power Wave positive output terminal, or both. 3. Make sure the welding parameters are correct for the process.	1. Perform the ***STT Chopper Board Test.*** 2. Perform the ***Current Transducer (STT) Test.*** 3. Check calibration using L.E. dianolostic software, and confirm correct wire feed speed to display 4. The Control Board may be faulty.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

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INPUT FILTER CAPACITOR DISCHARGE PROCEDURE

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

DESCRIPTION

This “safety” procedure should be performed before any internal maintenance or repair procedures are attempted on the Power Wave 455M. Capacitance normally discharges within 2 minutes of removing input power. This procedure is used to check that the capacitors have properly discharged.

MATERIALS NEEDED

3/8” Nut driver
Volt-ohmmeter
25-1000 ohms @ 25 watts (minimum) resistor
Electrically insulated gloves and pliers

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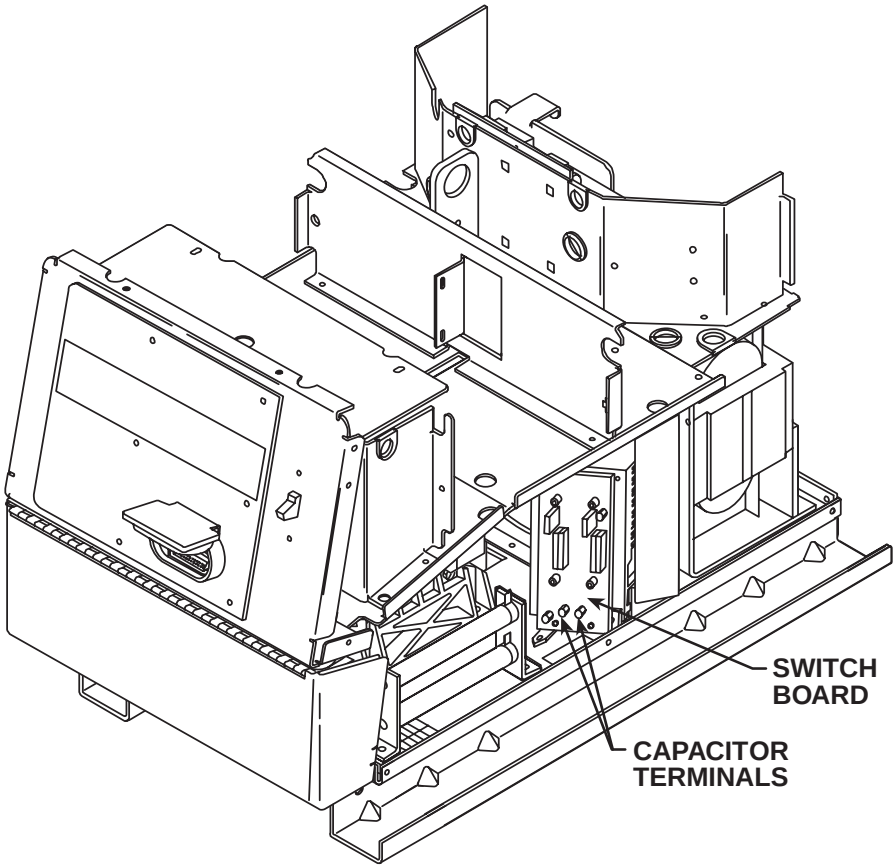
INPUT FILTER CAPACITOR DISCHARGE PROCEDURE *(CONTINUED)*

FIGURE F.1 – CAPACITOR DISCHARGE PROCEDURE



TEST PROCEDURE

1. Remove input power to the Power Wave 455M.
2. Using the 3/8” nut driver, remove the left and right case sides.
3. Be careful not to make contact with the capacitor terminals that are located in the bottom center of the left and right side switch boards. See Figure F.1.
4. Carefully check for a DC voltage at the capacitor terminals on both boards. Note the polarity is marked on the PC board and also lead #19 is positive.
5. If any voltage is present, proceed to Step #6. If no voltage is present, the capacitors are discharged.

NOTE: Normally the capacitors discharge in about two minutes after input power is removed.

6. Using the high wattage resistor (25-1000 ohms @ 25 watts (minimum), electrically insulated gloves and pliers, connect the resistor across the two capacitor terminals. Hold the resistor in place for 10 seconds. DO NOT TOUCH THE CAPACITOR TERMINALS WITH YOUR BARE HANDS. **NEVER USE A SOLID CONDUCTOR W/LESS THAN 25 OHM RESISTANCE FOR THIS PROCEDURE.**
7. Repeat procedure for the other capacitor.
8. Recheck the voltage across the capacitor terminals. The voltage should be zero. If any voltage remains, repeat the discharge procedure.

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SWITCH BOARD TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

DESCRIPTION

This test will help determine if the “power section” of the switch boards are functioning correctly. This test will NOT indicate if the entire PC board is functional. This resistance test is preferable to a voltage test with the machine energized because these boards can be damaged easily. In addition, it is dangerous to work on these boards with the machine energized.

MATERIALS NEEDED

3/8” Nut driver
3/8” Wrench
Analog/Digital volt-ohmmeter
Wiring Diagram

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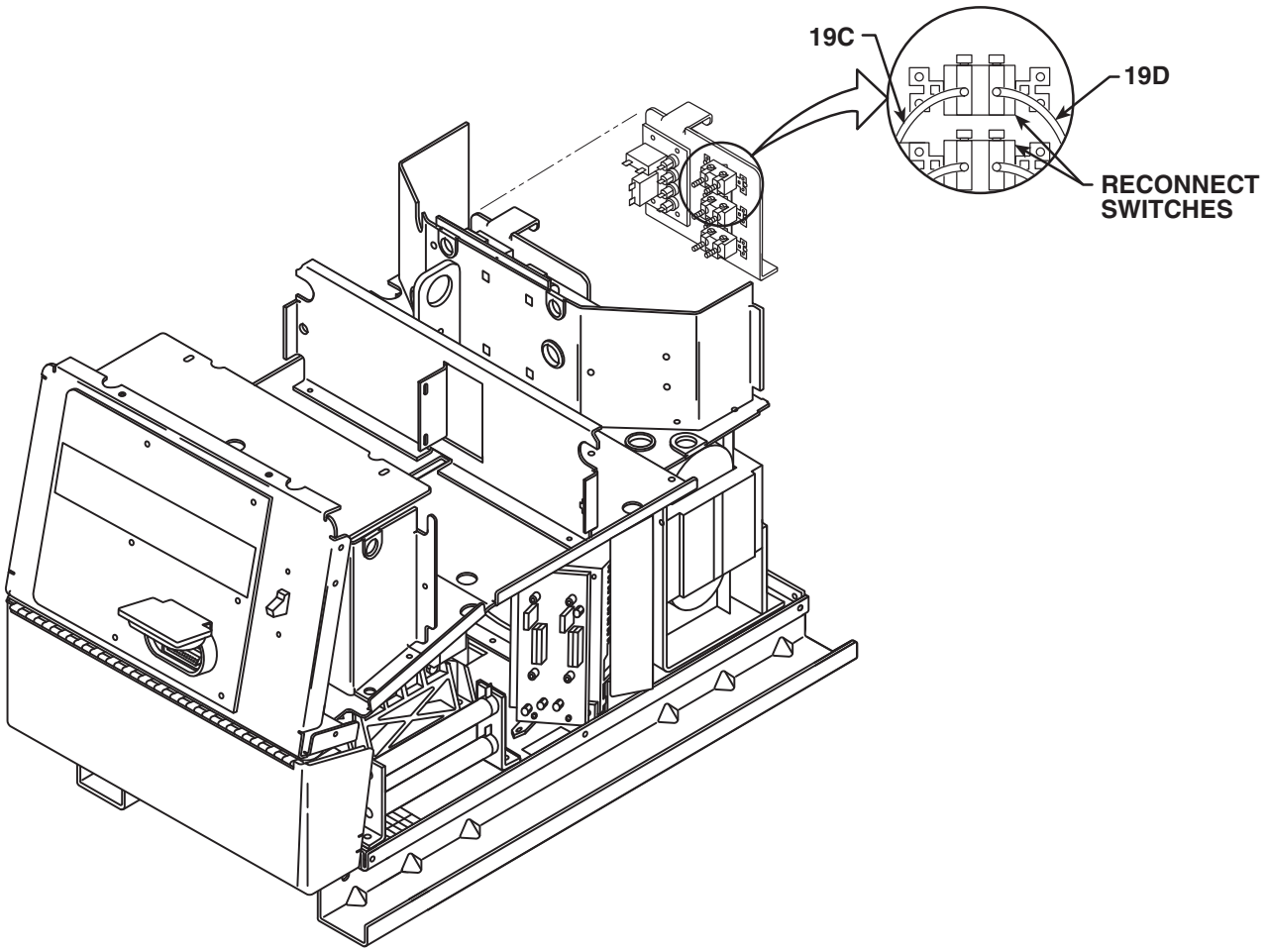
SWITCH BOARD TEST *(CONTINUED)*

FIGURE F.2 – RECONNECT SWITCHES



TEST PROCEDURE

1. Remove input power to the Power Wave 455M.
2. Perform the ***Capacitor Discharge*** Procedure.
3. Locate label and remove leads 19C and 19D from the reconnect switches with the 3/8" wrench. Note lead placement for reassembly. Clear leads. Refer to Figure F.2.
4. Using the Analog ohmmeter, perform the following resistance tests. Refer to ***Figure F.3*** for the test points. Any readings below 100 ohms can be considered a short circuit. However, readings usually are below 30 ohms.

   Check 11/12 to -20 and 11/12 to +19

   Check 13/14 to -20 and +19 to 13/14
5. If any test fails isolate the PC board and retest, if board still fails, replace switch board. See ***Switch Board Removal and Replacement.***
6. If the switch board tests are OK, check the molex pin connections and associated wiring from the switch boards to the control board. See the Wiring Diagram.

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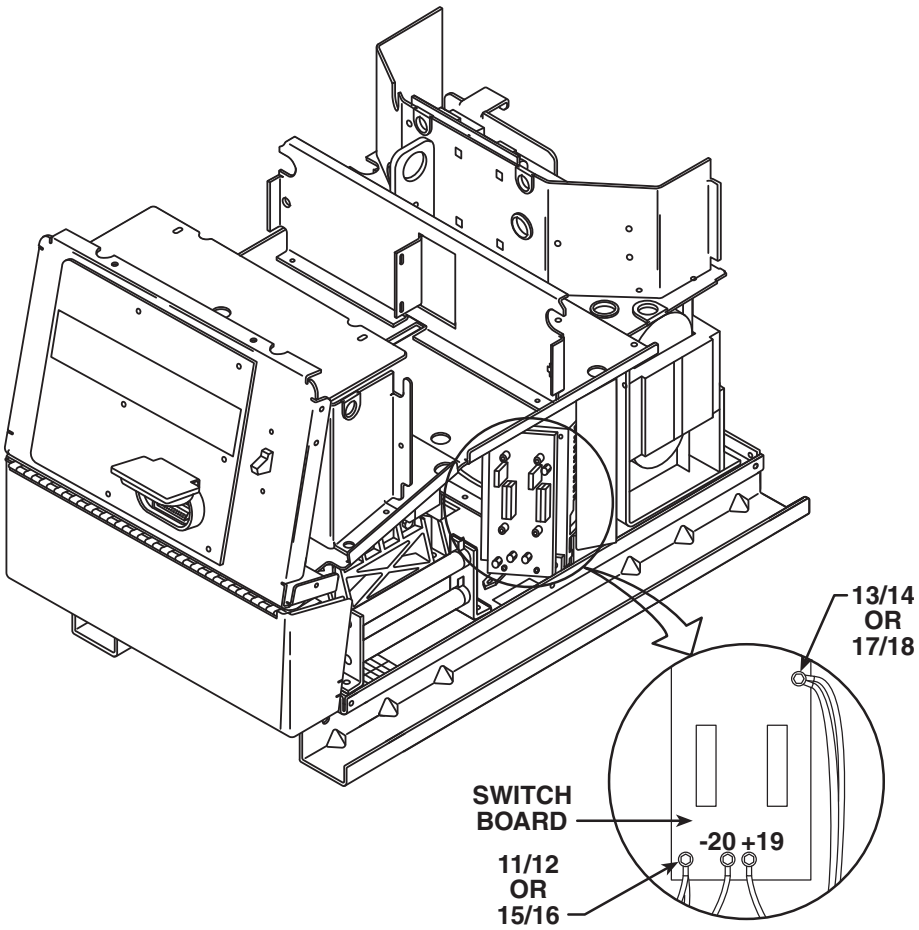
SWITCH BOARD TEST *(CONTINUED)*

FIGURE F.3 – SWITCH BOARD TEST POINTS



8. Reconnect leads 19C and 19D to the reconnect switches. Ensure that the leads are installed in the same location they were removed from.
9. Install the right and left case sides and top using the 3/8" nut driver.

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INPUT RECTIFIER TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will help determine if the input rectifier has “shorted” or “open” diodes.

MATERIALS NEEDED

Analog volt-ohmmeter
Phillips head screw driver
Wiring Diagram
3/8” Nut driver

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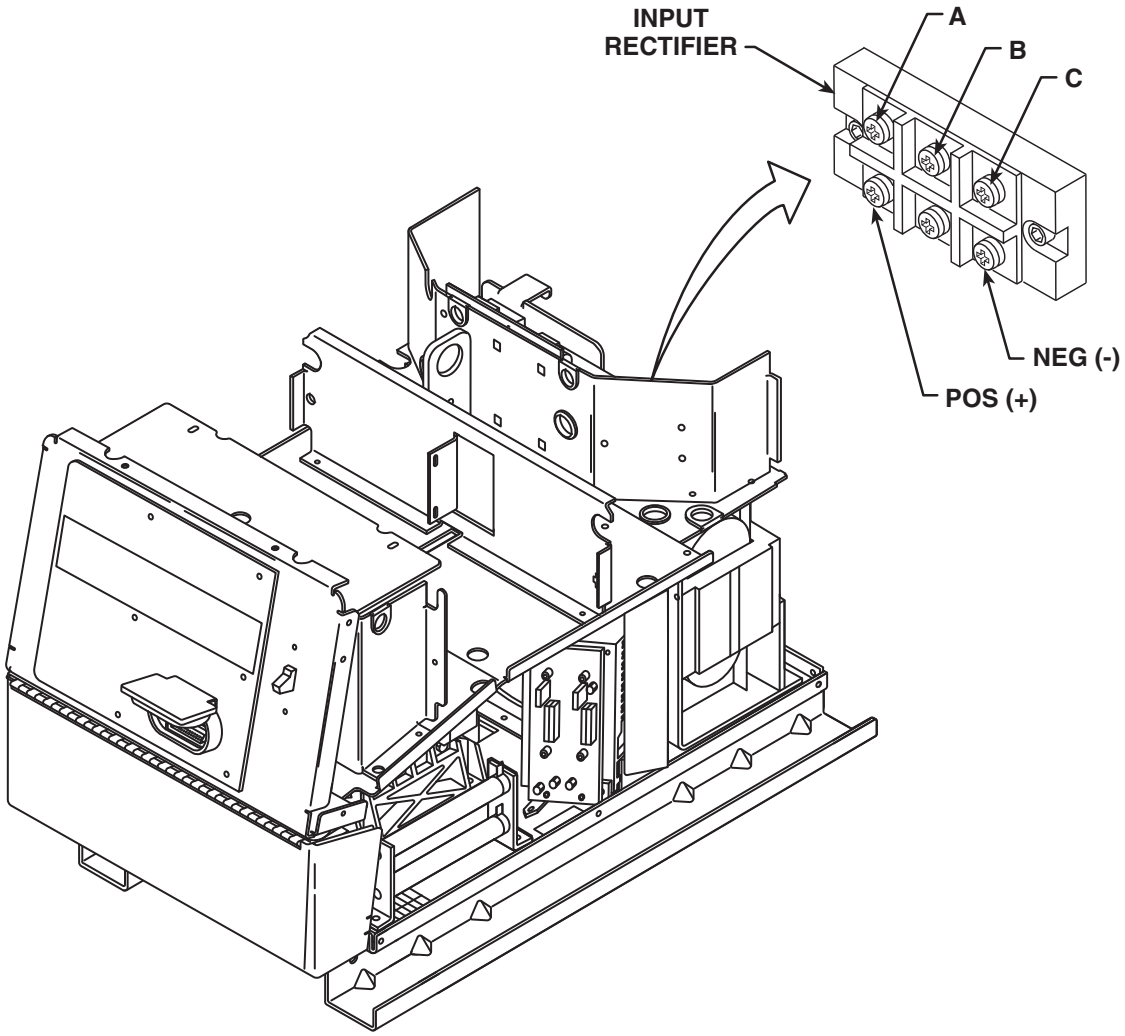
INPUT RECTIFIER TEST *(CONTINUED)*

FIGURE F.4 – INPUT RECTIFIER TEST



TEST PROCEDURE

1. Remove input power to the Power Wave 455M.
2. Using the 3/8” nut driver, remove the case top.
3. Perform the ***Capacitor Discharge*** Procedure.
4. Locate the Input Rectifier and lead locations. Refer to Figure F.4.

NOTE: Some silicone sealant may have to be removed from the input rectifier terminals. The G.E. silicone or equivalent should be replaced when test is complete.

5. With the phillips head screw driver remove the positive and negative leads from the rectifier.

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INPUT RECTIFIER TEST *(CONTINUED)*

6. Use the analog ohmmeter to perform the tests detailed in Table F.1.
7. If the input rectifier does not meet the acceptable readings outlined in the table, the component may be faulty. Replace.

NOTE: Before replacing the input rectifier, perform ***the Switch Board Test.***

8. When installing a new input rectifier, see ***Input Rectifier Removal and Replacement*** procedure.
9. If the input rectifier is good, be sure to reconnect the positive and negative leads to the correct terminals and torque to 31 in.-lbs. See the Wiring Diagram.
10. Replace any silicone sealant previously removed.
11. Reassemble and test.

TABLE F.1 – INPUT RECTIFIER TEST POINTS AND ACCEPTABLE READINGS

TEST POINT TERMINALS		ANALOG METER X100 RANGE
+ Probe	**- Probe**	**Acceptable Meter Readings**
A	NEG	Greater than 1000 ohms
B	NEG	Greater than 1000 ohms
C	NEG	Greater than 1000 ohms
A	POS	Approx. 500 ohms or less
B	POS	Approx. 500 ohms or less
C	POS	Approx. 500 ohms or less
NEG	A	Approx. 500 ohms or less
NEG	B	Approx. 500 ohms or less
NEG	C	Approx. 500 ohms or less
POS	A	Greater than 1000 ohms
POS	B	Greater than 1000 ohms
POS	C	Greater than 1000 ohms

This test can be performed using a digital volt/ohm meter on the “diode test” setting. Acceptable meter readings are: open or O.L., For the “Greater than 1000 ohms” and a decimal value less than one (example 0.045) in the approx 500 ohms position.

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INPUT CONTACTOR TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will help determine if the input contactor is functional and if the contacts are functioning correctly.

MATERIALS NEEDED

3/8” Nut driver
Volt-ohmmeter
External 24 VAC supply

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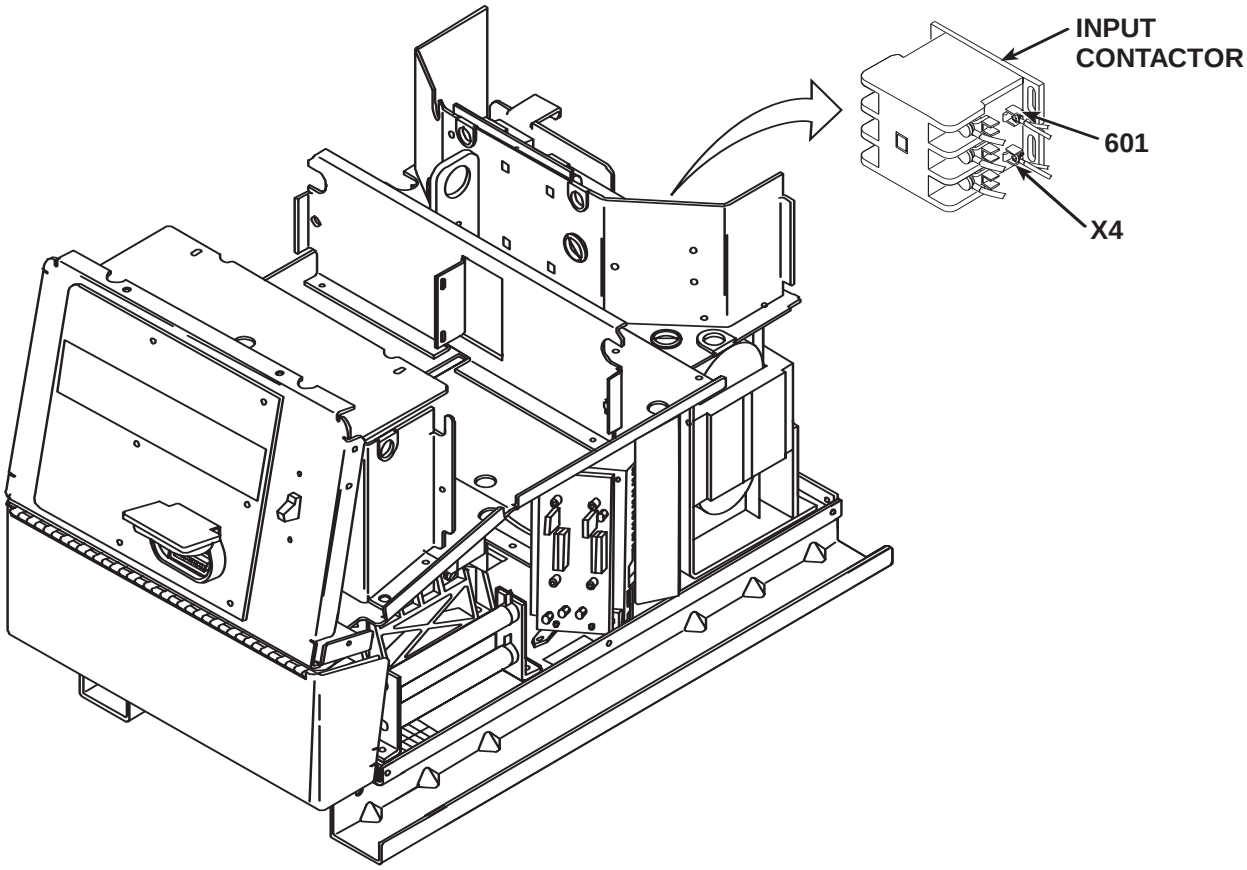
INPUT CONTACTOR TEST *(CONTINUED)*

FIGURE F.5 – INPUT CONTACTOR COIL



TEST PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8” nut driver, remove the input access panel and case top.
3. Locate, mark, and remove the two leads (601, X4) that are connected to the input contactor coil. Refer to Figure F.5.
4. Using the external 24 VAC supply, apply 24 VAC to the terminals of the input contactor coil. If the contactor does NOT activate, the input contactor is faulty. Replace.

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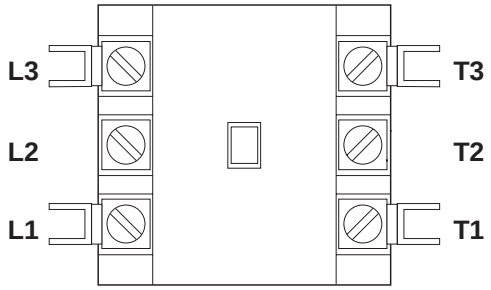
INPUT CONTACTOR TEST *(CONTINUED)*

FIGURE F.6 – INPUT CONTACTOR TEST POINTS



5. With the input contactor activated, check the continuity across the three sets of contacts. (Zero ohms or very low resistance is normal.) Refer to Figure F.6. If the resistance is high, the input contactor is faulty. Replace the input contactor.
6. When the contactor is NOT activated, the resistance should be infinite or very high across the contacts. If the resistance is low, the input contactor is faulty.
7. Reconnect the two leads (601, X4) to the input contactor coil.
8. Install the input access door and case top using the 3/8” nut driver.
9. Test.

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DC BUS POWER SUPPLY PC BOARD TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the DC Bus Power Supply PC Board is receiving and processing the proper voltages.

MATERIALS NEEDED

3/8” Nut driver
Volt/ohmmeter
Wiring Diagram

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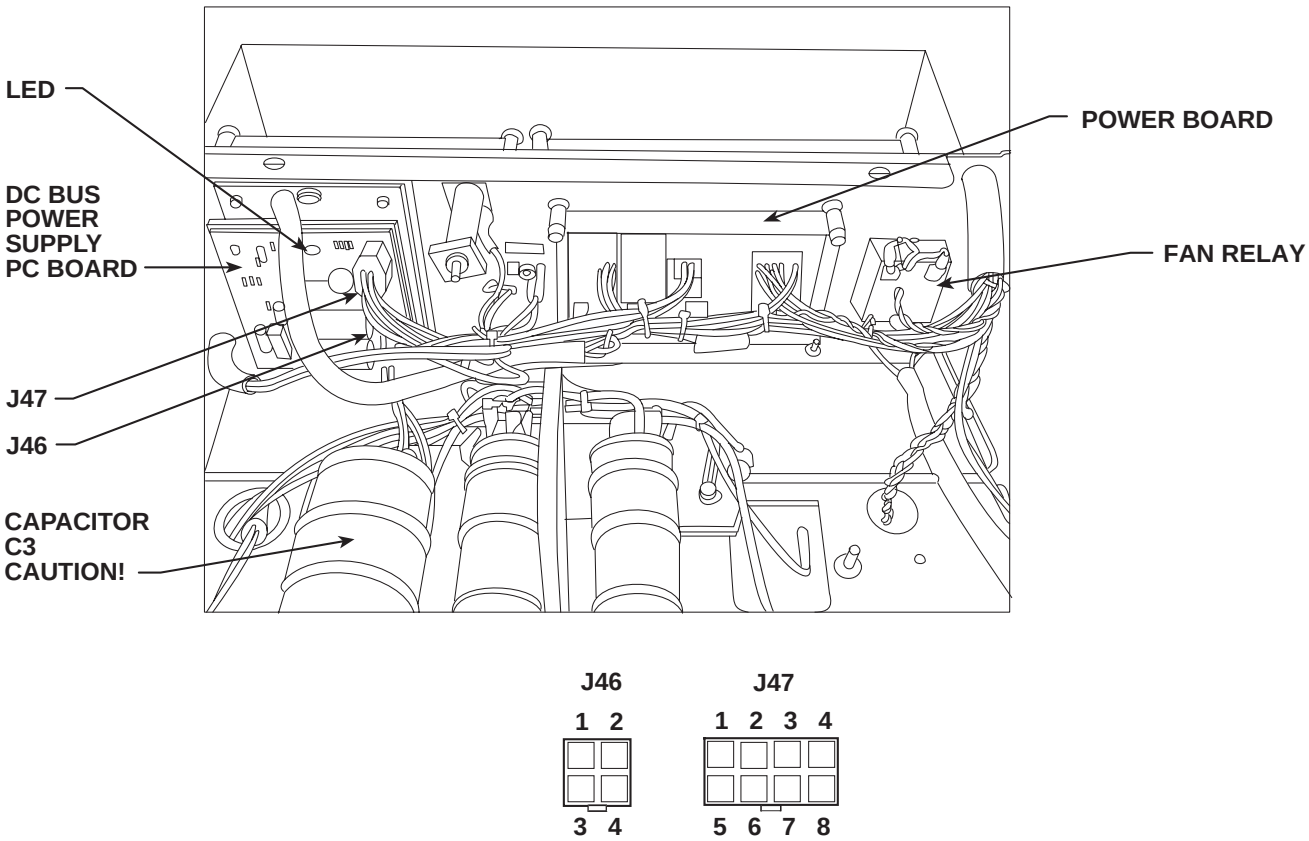
DC BUS POWER SUPPLY PC BOARD TEST *(CONTINUED)*

FIGURE F.7 – DC BUS POWER SUPPLY POWER SUPPLY PC BOARD



TEST PROCEDURE

1. Remove input power to the machine.
2. Using the 3/8” nut driver, remove the case top.
3. Locate the DC Bus Power Supply PC Board and plugs P46 and P47. See Figure F.7.
4. Carefully apply input power to the Power Wave 455M.

⚠ WARNING

ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

5. Turn on the Power Wave 455M. The LED on the DC Bus Power Supply PC Board should light.

DC BUS POWER SUPPLY PC BOARD TEST*(CONTINUED)*

6. Check the DC Bus Power Supply PC Board input and output voltages according to Table F.3. See ***Figure F.7*** and the Wiring Diagram.

If plug P46 pin 1-3 voltage is missing, perform ***T1 Auxiliary Transformer Test***.

⚠ WARNING

ELECTRIC SHOCK can kill.

High voltage is present at the terminals of Capacitor C3 near where testing is to be done.

7. If all the voltages are correct, the DC Bus Power Supply PC Board is operating properly.
8. If any of the output voltages are not correct and the input voltage is correct, the DC Bus Power Supply PC Board may be faulty, or the supplied board may be bad.
9. If the input voltage is not correct, check the leads between the DC Bus Power Supply PC Board and the Power PC Board Rectifier. See the Wiring Diagram.
10. When finished testing, replace the case top.

TABLE F.2 – DC BUS POWER SUPPLY PC BOARD VOLTAGE TABLE

Positive Meter Probe Test Point	Negative Meter Probe Test Point	Approximate Voltage Reading	Conditions/Comments
Plug P46 – Pin 1	Plug P46 – Pin 3	65 – 75 VDC	Should be same as the Power PC Board Rectifier
Plug P47 – Pin 7	Plug P47 – Pin 6	38.0 – 42.0 VDC	Supply to Power PC Board
Plug P47 – Pin 8	Plug P47 – Pin 6	38.0 – 42.0 VDC	Supply to Power PC Board
Plug P47 – Pin 4	Plug P47 – Pin 2	38.0 – 42.0 VDC	Supply to Feed Head PC Board
Plug P47 – Pin 3	Plug P47 – Pin 1	38.0 – 42.0 VDC	Supply to S1 Wire Feeder Receptacle

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POWER BOARD TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will help determine if the Power Board is receiving the correct voltages and also if the Power Board is regulating and producing the correct DC voltages.

MATERIALS NEEDED

3/8” Nut driver
Volt-ohmmeter
Wiring Diagram

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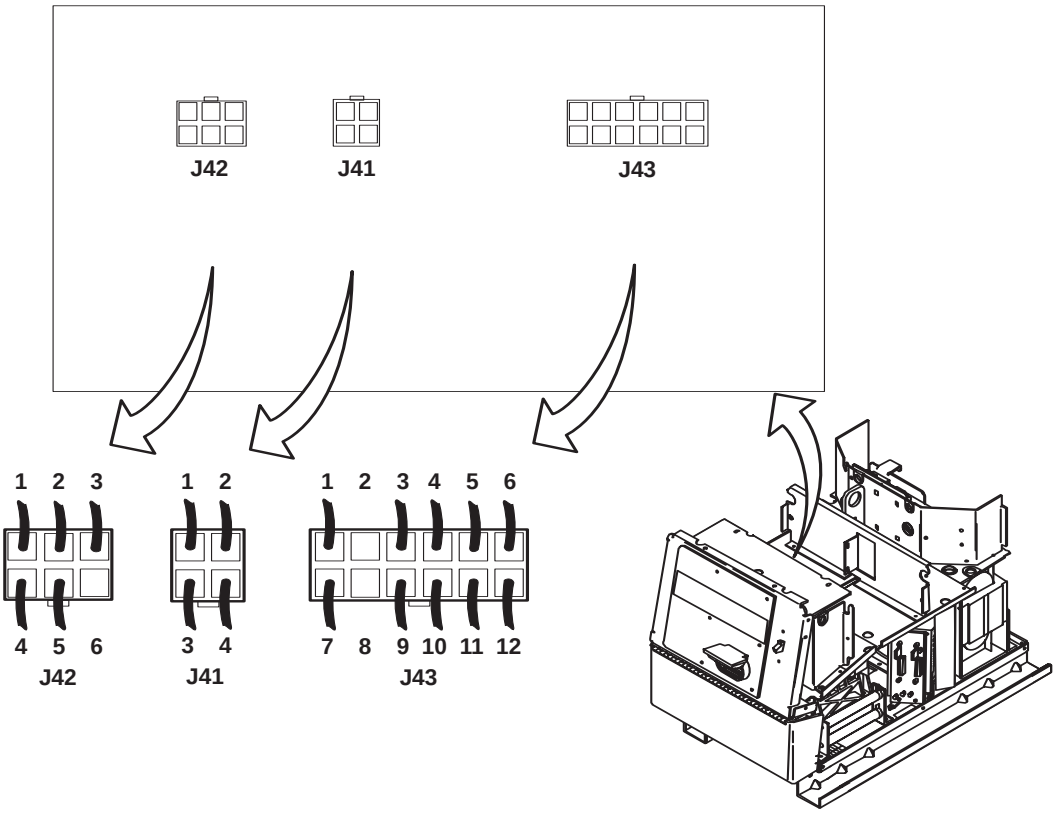
POWER BOARD TEST *(CONTINUED)*

FIGURE F.8 – POWER BOARD TEST



TEST PROCEDURE

1. Remove input power to the Power Wave 455M.
2. Using the 3/8" nut driver, remove the case top.
3. Perform the ***Capacitor Discharge*** Procedure.
4. Locate the Power Board and plugs J42 and J43. **Do not remove plugs or leads from the Power Board**. Refer to Figure F.8.
5. Carefully apply input power to the Power Wave 455M.
6. Turn on the Power Wave 455M. Carefully test for the correct voltages at the Power Board according to ***Table F.3.***
7. If either of the 40 VDC voltages is low or not present at plug J41, perform the ***DC Bus PC Board Test***. See the Wiring Diagram. If indicated, perform the ***T1 Auxiliary Transformer Test.***
8. If any of the DC voltages are low or not present at plugs J42 and/or 43, the Power Board may be faulty.
9. If power board is replaced, reassemble and test machine.

⚠ WARNING

ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

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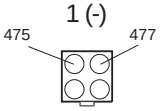
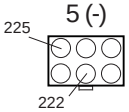
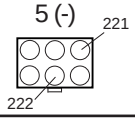
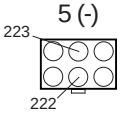
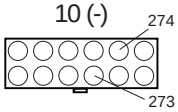
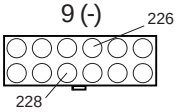
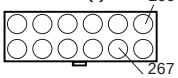
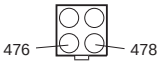
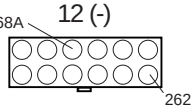
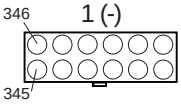
POWER BOARD TEST *(CONTINUED)*

TABLE F.3 – POWER BOARD VOLTAGE CHECKS

CHECK POINT LOCATION	TEST DESCRIPTION	CONNECTOR PLUG PIN NO.	LEAD NO. OR IDENTITY	NORMAL ACCEPTABLE VOLTAGE READING
POWER BOARD CONNECTOR PLUG J41	CHECK 40 VDC INPUT FROM DC BUS BOARD	2 (+) 1 (-) 	477 (+) 475 (-)	38 – 42 VDC
POWER BOARD CONNECTOR PLUG J42	CHECK +15 VDC SUPPLY FROM POWER BOARD	1 (+) 5 (-) 	225 (+) 222 (-)	+15 VDC
POWER BOARD CONNECTOR PLUG J42	CHECK +5 VDC SUPPLY FROM POWER BOARD	3 (+) 5 (-) 	221 (+) 222 (-)	+5 VDC
POWER BOARD CONNECTOR PLUG J42	CHECK -15 VDC SUPPLY FROM POWER BOARD	2 (+) 5 (-) 	222 (+) 223 (-)	-15 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +5 VDC ARCLINK SUPPLY FROM POWER BOARD	5 (+) 10 (-) 	274 (+) 273 (-)	+5 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +5 VDC “RS-232” SUPPLY FROM POWER BOARD	4 (+) 9 (-) 	226 (+) 228 (-)	+5 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +15 VDC SPI SUPPLY FROM POWER BOARD	6 (+) 11 (-) 	266 (+) 267 (-)	+15 VDC
POWER BOARD CONNECTOR PLUG J41	CHECK +40 VDC INPUT FROM DC BUS BOARD	4 (+) 3 (-) 	478 (+) 476 (-)	38 – 42 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +5 VDC SPI SUPPLY FROM POWER BOARD	3 (+) 12 (-) 	268A (+) 262 (-)	+5 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +20 VDC STT SUPPLY FROM POWER BOARD	7 (+) 1 (-) 	345 (+) 346 (-)	+20 VDC

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INPUT BOARD TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will help determine if the Input Board is sending the correct voltages and also if the Input Board is regulating and producing the correct DC voltages.

MATERIALS NEEDED

3/8” Nut driver
Volt-ohmmeter
Wiring Diagram

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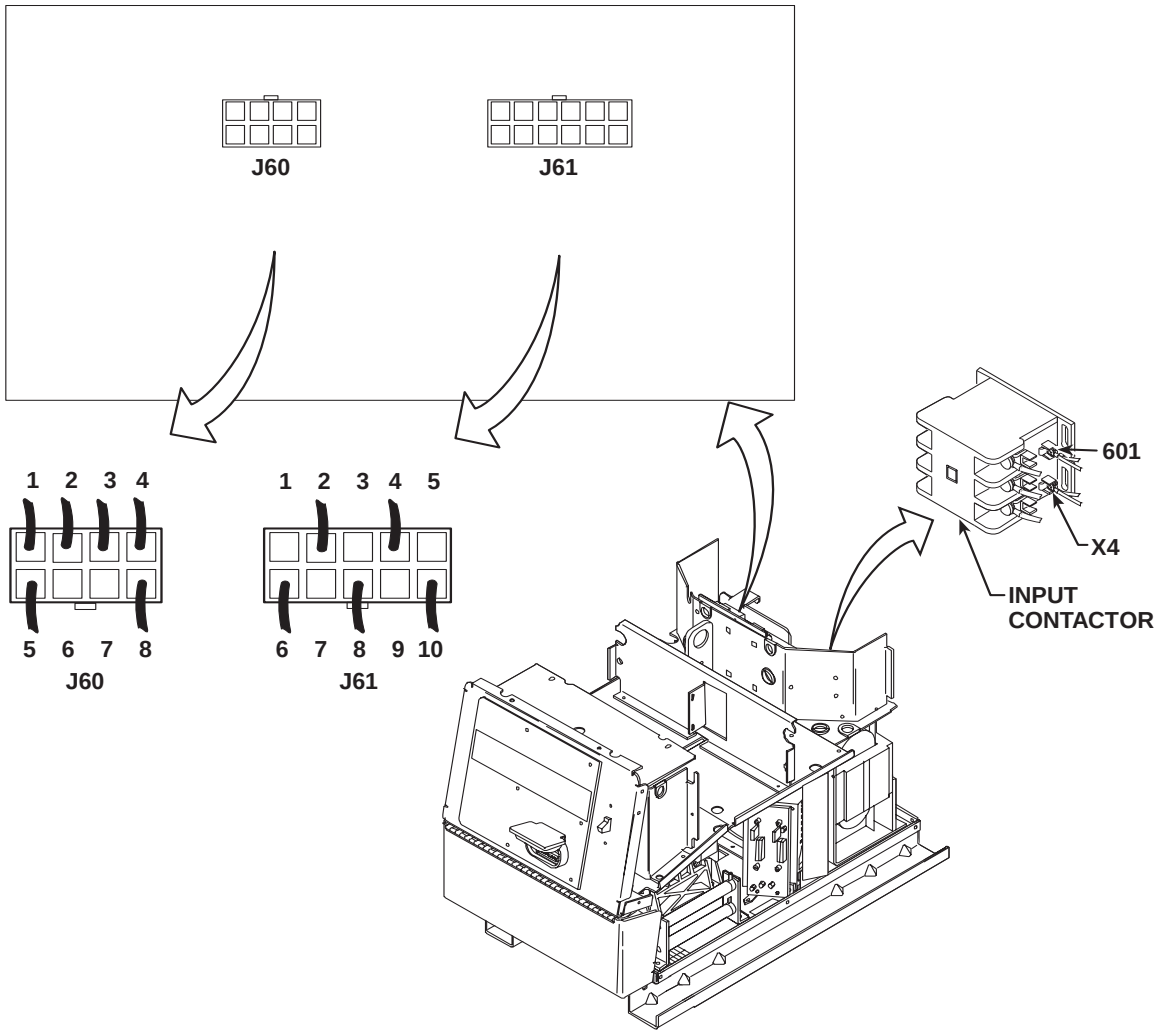
INPUT BOARD TEST *(CONTINUED)*

FIGURE F.9 – INPUT CONTACTOR CR1



TEST PROCEDURE

1. Remove input power to the Power Wave 455M.
2. Using the 3/8" nut driver, remove the case top, and input access cover.
3. Remove lead X4 from the coil terminal of main input contactor CR1. Insulate lead X4. Refer to Figure F.9.
4. Carefully apply input power to the Power Wave 455M.

⚠ WARNING

ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

5. Turn on the Power Wave 455M. Carefully test for the correct voltages according to ***Table F.4.***

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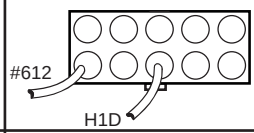
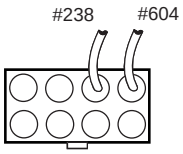
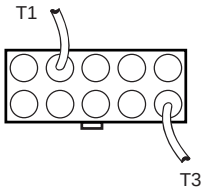
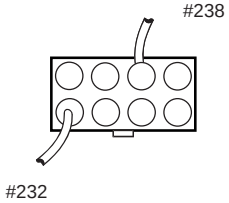
INPUT BOARD FUNCTION TEST*(CONTINUED)*

TABLE F.4 – INPUT BOARD VOLTAGE CHECKS

TEST POINTS	LEAD NUMBERS	EXPECTED VOLTAGE READINGS	COMMENTS
PLUG J61 PIN 8 (H1D) TO PLUG J61 PIN 6 (612)	J61 	SAME AS INPUT VOLTAGE	Present when Input Switch SW1 is closed. If not, check input lines and line switch and wiring.
PLUG J60 PIN 3 (238) TO PLUG J60 PIN 4 (604)	J60 	13 – 15 VDC	This is the Coil Voltage for the Pre-Charge Relay. Normally this DC Voltage will be present 6 seconds after Input Switch SW1 is activated. This 13 - 15 VDC will remain for approximately 6 seconds and then be removed. The Relay is controlled by the Control Board. See the Wiring Diagram.
PLUG J61 PIN 10 (T3) TO PLUG J61 PIN 2 (T1)	J61 	A LITTLE LESS THAN INPUT VOLTAGE	This is Pre-Charge Voltage and will normally be present 6 seconds after activating Input Switch SW1. The Pre-Charge Voltage should remain for approximately 6 seconds and then be removed. It should start at zero and ramp up to 170 - 200 V.A.C. If zero volts - check input board resistors, and check for a shorted main input rectifier.
PLUG J60 PIN 3 (238) TO PLUG J60 PIN 5 (232)	J60 	13 – 15 VDC	This is the DC Coil Voltage for the Control Relay. Normally this DC Voltage will be present approximately 12 seconds after Input Switch SW1 is activated. The Relay is controlled by the Control PC Board. See the Wiring Diagram. Voltage will not be applied if capacitor precharge is incorrect.

INPUT BOARD TEST*(CONTINUED)*

6. Remove input power to the Power Wave 455M. If any of the voltages are low or not present, perform the ***Input Contactor Test***. If that checks out, the Input Board may by faulty.
7. Reconnect lead X4 to the main input contactor CR1 coil terminal.
8. Carefully apply the correct input voltage to the Power Wave 455M.

⚠ WARNING

ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

9. Turn on the Power Wave 455M. Check for the presence of 24 VAC from lead X4 to lead 601. See ***Figure F. 9***. If the voltage is not present, perform the ***Auxiliary Transformer #1 Test.***

   This 24 VAC is the coil voltage for main input contactor CR1. It will normally be present approximately 12 seconds after input line switch (SW1) is activated.
10. When the test is completed, remove input power from the Power Wave 455M.
11. Install the case top and reconnect cover using the 3/8” nut driver.

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STT CHOPPER BOARD TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will help determine if the STT Chopper Board is receiving the necessary voltages to function and if the related circuitry is correct.

MATERIALS NEEDED

3/8” Nut driver
Volt-ohmmeter
Wiring Diagram

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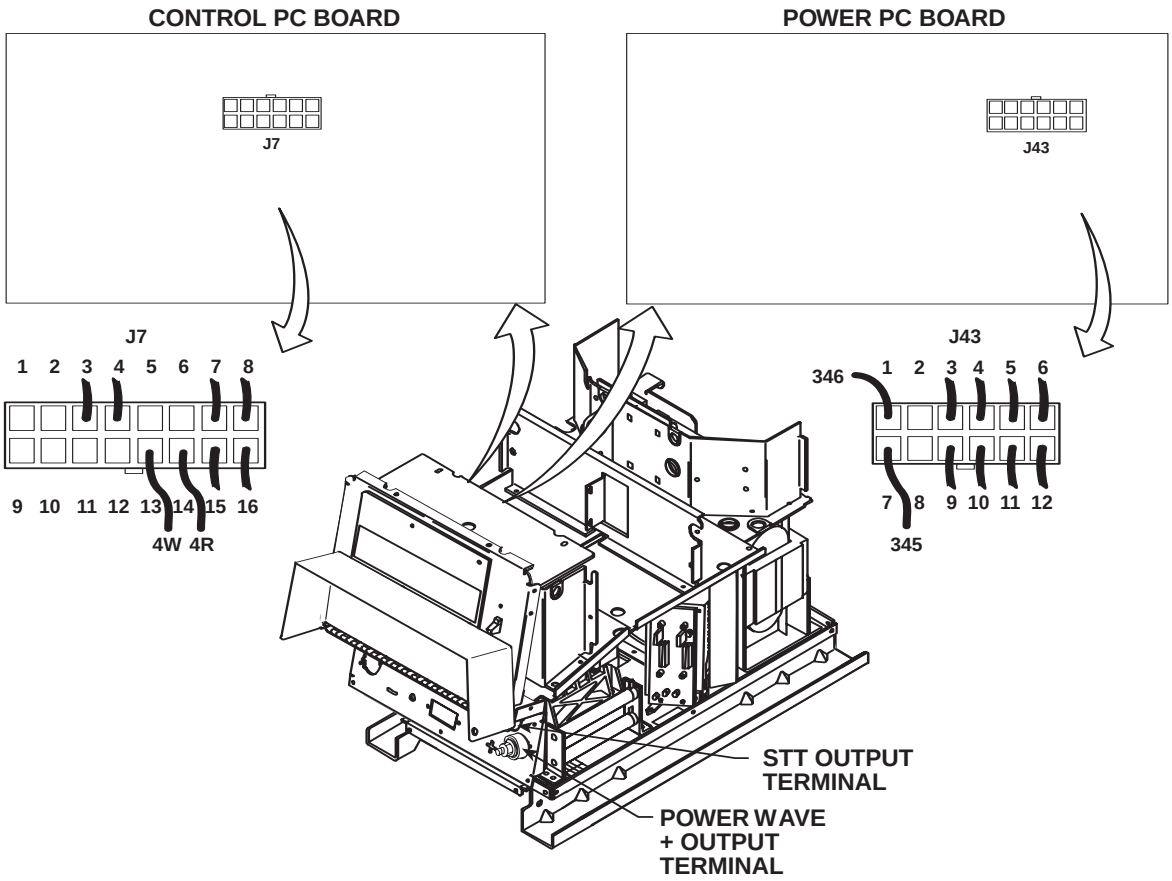
STT CHOPPER BOARD TEST *(CONTINUED)*

FIGURE F.10 – STT CHOPPER BOARD TEST DETAILS



TEST PROCEDURE

1. Remove input power to the Power Wave 455M.
2. Using the 3/8” nut driver, remove the case top and the control box cover. See Figure F.10.
3. Perform the following resistance tests:

   + probe on the STT output terminal

   - probe on the Power Wave + output terminal

   The reading should be approximately 300,000 ohms

   + probe on the Power Wave + output terminal

   - probe on the STT output terminal

   The reading should be less than 500 ohms

   If both the polarity resistance tests are low, either the STT Chopper Module is faulty or diode D6 is shorted. See the Wiring Diagram.

STT CHOPPER BOARD TEST *(CONTINUED)*

4. Carefully apply input power to the Power Wave 455M.

⚠ WARNING

ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

For steps 5 and 6, see ***Figure F.10.***

5. Turn on the Power Wave 455M. Measure the voltage from Power Board plug J43 lead 345 pin 7 (+) to lead 346 pin 1 (-). The voltage should be approximately 20 VDC. If not correct, the Power Board may be faulty.
6. Measure the voltage from Control Board plug J7 lead 4W pin 13 (-) to lead 4R pin 14 (+). The voltage should be 4 – 5 VDC. This is the pulse width modulation signal to the STT Chopper Board. If not correct, the Control Board may be faulty.
7. When the test is completed, remove input power from the Power Wave 455M.
8. Install the case top and control box cover using the 3/8” nut driver.

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POWER WAVE CURRENT TRANSDUCER TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will help determine if the Power Wave current transducer and associated wiring is functioning correctly.

MATERIALS NEEDED

3/8” nut driver
Volt-Ohmmeter

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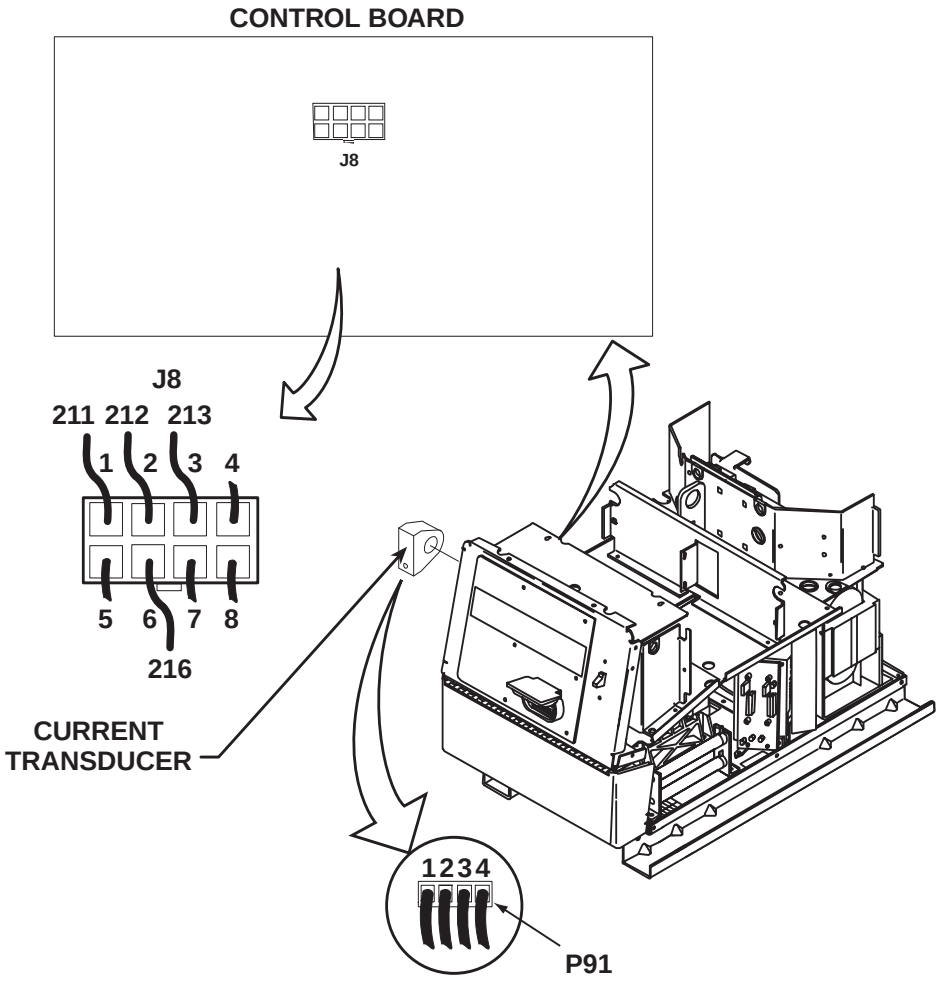
POWER WAVE CURRENT TRANSDUCER TEST *(CONTINUED)*

FIGURE F.11 – POWER WAVE CURRENT TRANSDUCER TEST



TEST PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8” nut driver, remove the case top and the control box cover.
3. Locate the Power Wave current transducer leads at Control Board plug J8. See Figure F.11.
4. Carefully apply input power to the Power Wave 455.

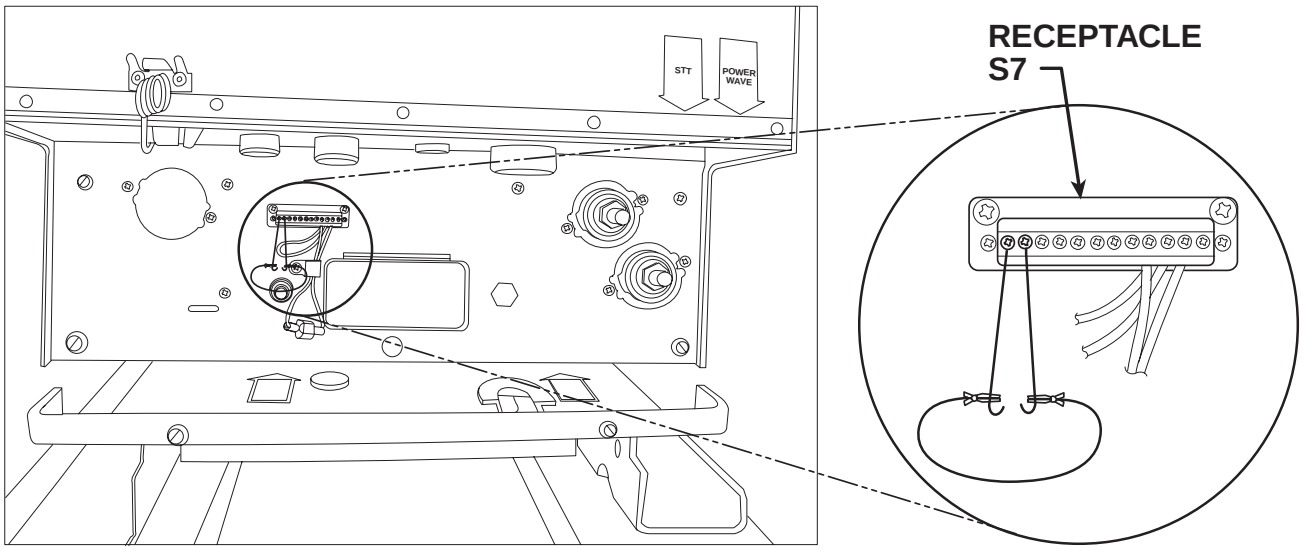
⚠ WARNING

ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

POWER WAVE CURRENT TRANSDUCER TEST *(CONTINUED)*

FIGURE F.12 – RECEPTACLE S7 TRIGGERED



5. Turn on the Power Wave 455. Check for the correct DC supply voltage to the current transducer at plug J8. See ***Figure F.11.***

   A. Pin 2 (lead 212+) to pin 6 (lead 216-) should read +15 VDC.

   B. Pin 3 (lead 213-) to pin 6 (lead 216+) should read -15 VDC.

   If the DC supply voltages are not present, the control board may be faulty.

6. If both of the supply voltages are low or missing, check the associated leads between plug J8 and current transducer plug P91 and the Control Board.

NOTE: The machine can be triggered by jumpering pin 1 to pin 2 at receptacle S7. See Figure F.12.

7. With the Power Wave 455 triggered, check the feedback voltage from the current transducer. The current feedback voltage can be read at plug J8 on the Control Board.

   A. Pin 1 (lead 211) to pin 6 (lead 216) should read 2.0 VDC (machine loaded to 250 amps).

POWER WAVE CURRENT TRANSDUCER TEST *(CONTINUED)*

8. If for any reason the machine cannot be loaded to 250 amps, Table F.5 shows what feedback voltage is produced at various current loads.
9. If the correct supply voltages are applied to the current transducer, and with the machine loaded, the feedback voltage is missing or not correct, the current transducer may be faulty. Also make certain that lead 211 (plug J8 pin 1) has continuity (zero ohms) between the current transducer and the control board. See the Wiring Diagram.
10. Install the right side case cover using the 3/8" nut driver.

TABLE F.5 - CURRENT FEEDBACK AT VARIOUS OUTPUT LOADS

OUTPUT LOAD CURRENT	EXPECTED TRANSDUCER FEEDBACK VOLTAGE
500	4.0
450	3.6
400	3.2
350	2.8
300	2.4
250	2.0
200	1.6
150	1.2
100	0.8
50	0.4

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STT CURRENT TRANSDUCER TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will help determine if the STT current transducer and associated wiring is functioning correctly.

MATERIALS NEEDED

3/8” nut driver
Volt-Ohmmeter

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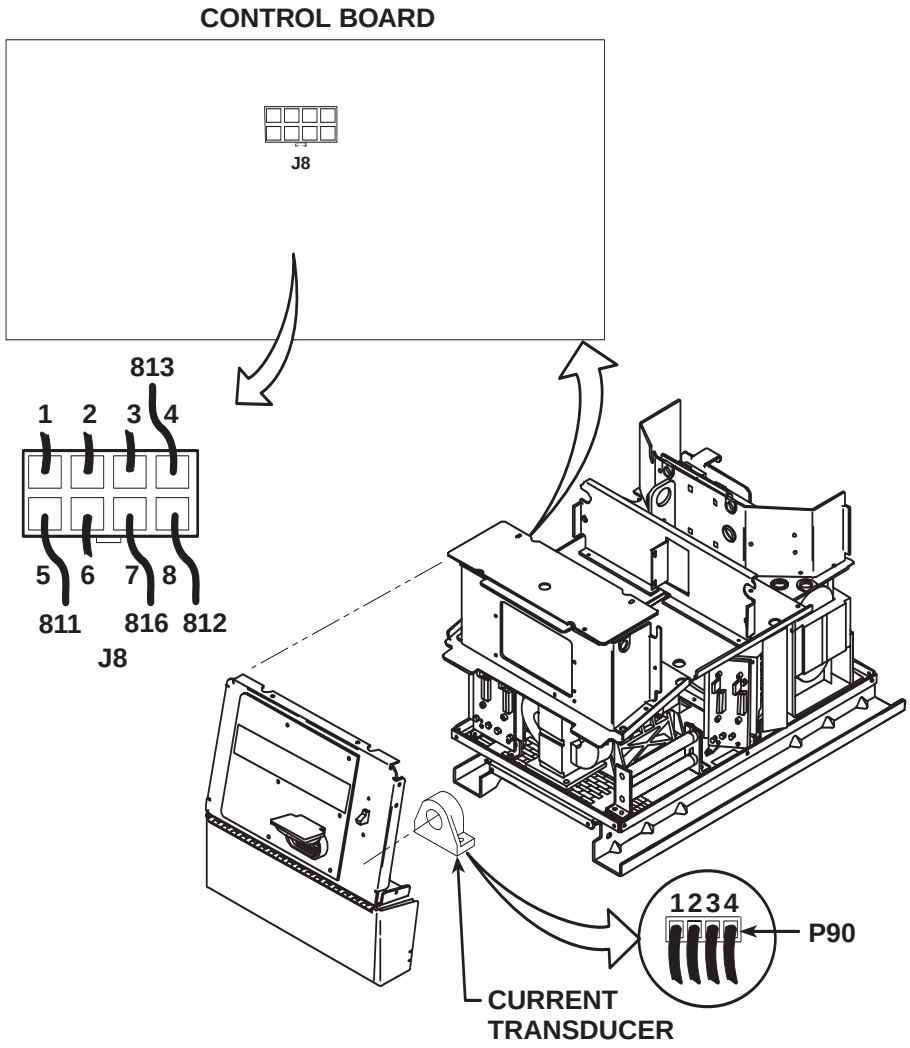
STT CURRENT TRANSDUCER TEST *(CONTINUED)*

FIGURE F.13 – STT CURRENT TRANSDUCER TEST



TEST PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8” nut driver, remove the case top and the control box cover.
3. Locate the STT current transducer leads at Control Board plug J8. See Figure F.13.
4. Carefully apply input power to the Power Wave 455M.

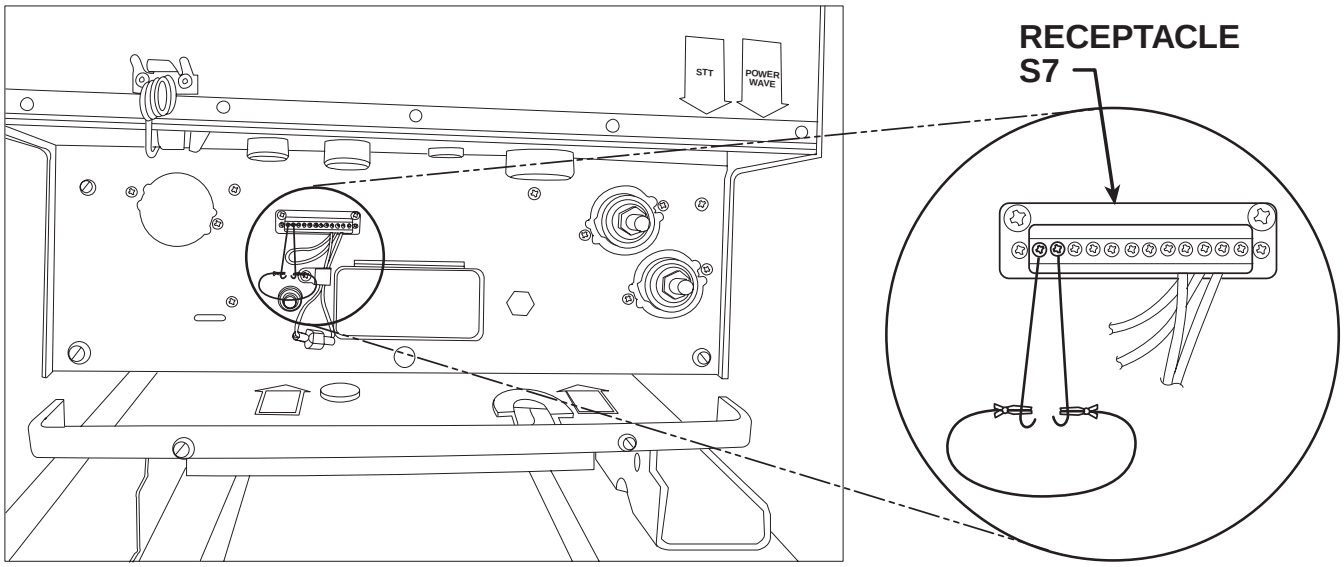
⚠ WARNING

ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

STT CURRENT TRANSDUCER TEST *(CONTINUED)*

FIGURE F.14 – RECEPTACLE S7 TRIGGERED



5. Turn on the Power Wave 455M. Check for the correct DC supply voltage to the current transducer at plug J8.
   A. Pin 8 (lead 812+) to pin 7 (lead 816-) should read +15 VDC.
   B. Pin 4 (lead 813-) to pin 7 (lead 816+) should read -15 VDC.

   If the DC supply voltages are not present, the control board may be faulty.
6. If both of the supply voltages are low or missing, check the associated leads between plug J8 and current transducer plug P90 and the Control Board.

NOTE: The machine can be triggered by jumpering pin 1 to pin 2 at receptacle S7. See Figure F. 14.

7. With the Power Wave 455M triggered, check the feedback voltage from the current transducer. The current feedback voltage can be read at plug J8 on the Control Board.
   A. Pin 5 (lead 811) to pin 7 (lead 816) should read 0.4 VDC (machine loaded to 50 amps).

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STT CURRENT TRANSDUCER TEST *(CONTINUED)*

8. If for any reason the machine cannot be loaded to 50 amps, ***Table F.6*** shows what feedback voltage is produced at various current loads. S.T.T. stud is limited to 325 amps.
9. If the correct supply voltages are applied to the current transducer, and with the machine loaded, the feedback voltage is missing or not correct, the current transducer may be faulty. Also make certain that lead 811 (plug J8 pin 5) has continuity (zero ohms) between the current transducer and the control board. See the Wiring Diagram.
10. Install the right side case cover using the 3/8" nut driver.

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OUTPUT RECTIFIER TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

The test will help determine if any of the output rectifiers are shorted.

MATERIALS NEEDED

Analog Volt-Ohmmeter
3/8” Nut driver
5/16” Wrench

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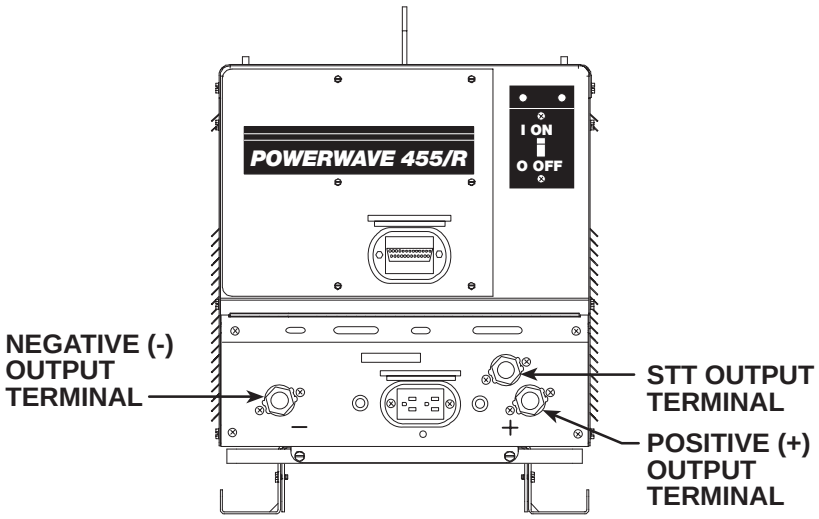
OUTPUT RECTIFIER TEST *(CONTINUED)*

FIGURE F.15 – OUTPUT RECTIFIER TEST



TEST PROCEDURE

1. Remove main input supply power to the Power Wave 455M.
2. Remove any output load that may be connected to the Power Wave 455M.
3. With the analog ohmmeter, measure the resistance between the positive and negative output terminals (NOT the STT terminal). Refer to Figure F.15.
4. If the reading is approx. 50 ohms, the output rectifier modules are not shorted. If the reading is less than 10 ohms, one or more of the rectifier modules are shorted. Reverse meter probe and verify low reading. Refer to the ***Output Rectifier Module Replacement*** procedure.
5. Remove the case top perform the ***Input Filter Capacitor Discharge*** procedure.

IMPORTANT: The positive (+) meter probe must be attached to the positive (+) output terminal and the negative (-) meter probe must be attached to the negative (-) output terminal.

6. Using the 5/16” wrench, remove and insulate lead 202A from the negative output terminal. Repeat step 4 to confirm.
7. Reconnect lead 202A to the negative output terminal.
8. Replace the case top and sides.

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AUXILIARY TRANSFORMER NO. 1 TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the correct voltage is being applied to the primary of Auxiliary Transformer No. 1 and also if the correct voltages are being induced on the secondary windings of the transformer.

MATERIALS NEEDED

Volt-ohmmeter (Multimeter)
3/8” Nut driver
Wiring Diagram

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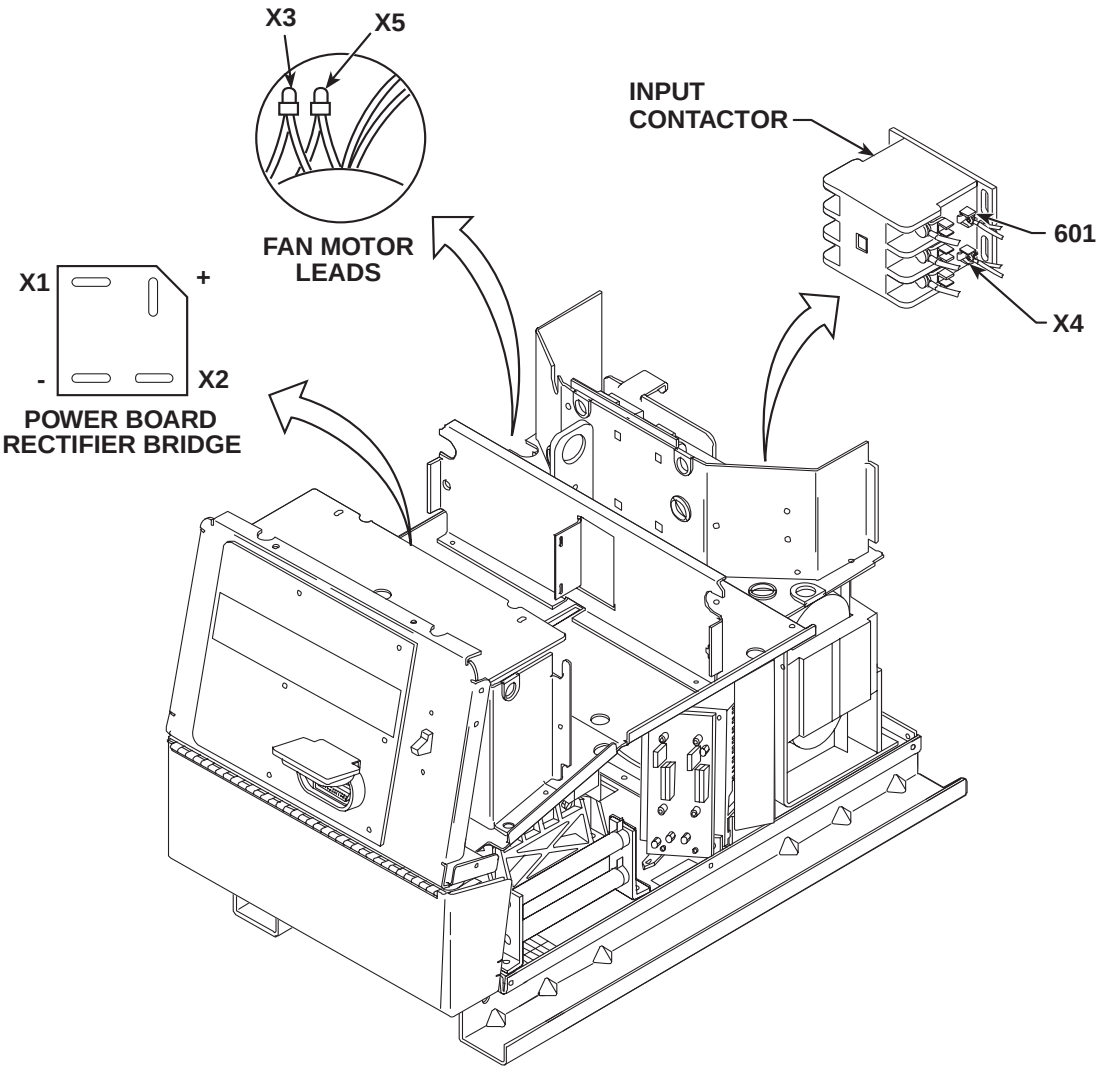
AUXILIARY TRANSFORMER NO. 1 TEST *(CONTINUED)*

FIGURE F.16 – AUXILIARY TRANSFORMER NO. 1 TEST



TEST PROCEDURE

1. Remove the main input power to the Power Wave 455 machine.
2. Using the 3/8” nut driver, remove the case top.
3. Perform the ***Capacitor Discharge*** procedure.
4. Locate secondary leads X1 and X2 (at power board rectifier bridge). Refer to Figure F.16.
5. Locate secondary leads X3 and X5 (fan motor leads).
6. Locate secondary lead X4 (at main contactor).

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AUXILIARY TRANSFORMER NO. 1 TEST *(CONTINUED)*

TABLE F.6 – SECONDARY VOLTAGES

LEAD IDENTIFICATION	NORMAL EXPECTED VOLTAGE
X1 to X2	52 VAC
X3 to X5	115 VAC
X3 to X4	24 VAC

7. Carefully apply the correct input voltage to the Power Wave 455M.

⚠ WARNING

ELECTRIC SHOCK can kill.

High voltage is present at primary of the Auxiliary Transformer.

8. Turn on PW455M.
9. Check for the correct secondary voltages according to Table F.6.

NOTE: The secondary voltages will vary if the input line voltage varies.

10. If the correct secondary voltages are present, the T1 auxiliary transformer is functioning properly. If any of the secondary voltages are missing or low, check to make certain the primary is configured correctly for the input voltage applied. See the Wiring Diagram.
11. If the correct input voltage is applied to the primary, and the secondary voltage(s) are not correct, the T1 transformer may be faulty.
12. Replace any cables ties and insulation removed earlier.
13. Install the case sides and top using the 3/8” nut driver.

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AUXILIARY TRANSFORMER NO. 2 TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This test will determine if the correct voltage is being applied to the primary of Auxiliary Transformer No. 2 and also if the correct voltages are being induced on the secondary windings of the transformer.

MATERIALS NEEDED

Volt-ohmmeter (Multimeter)
3/8" Nut driver
Wiring Diagram

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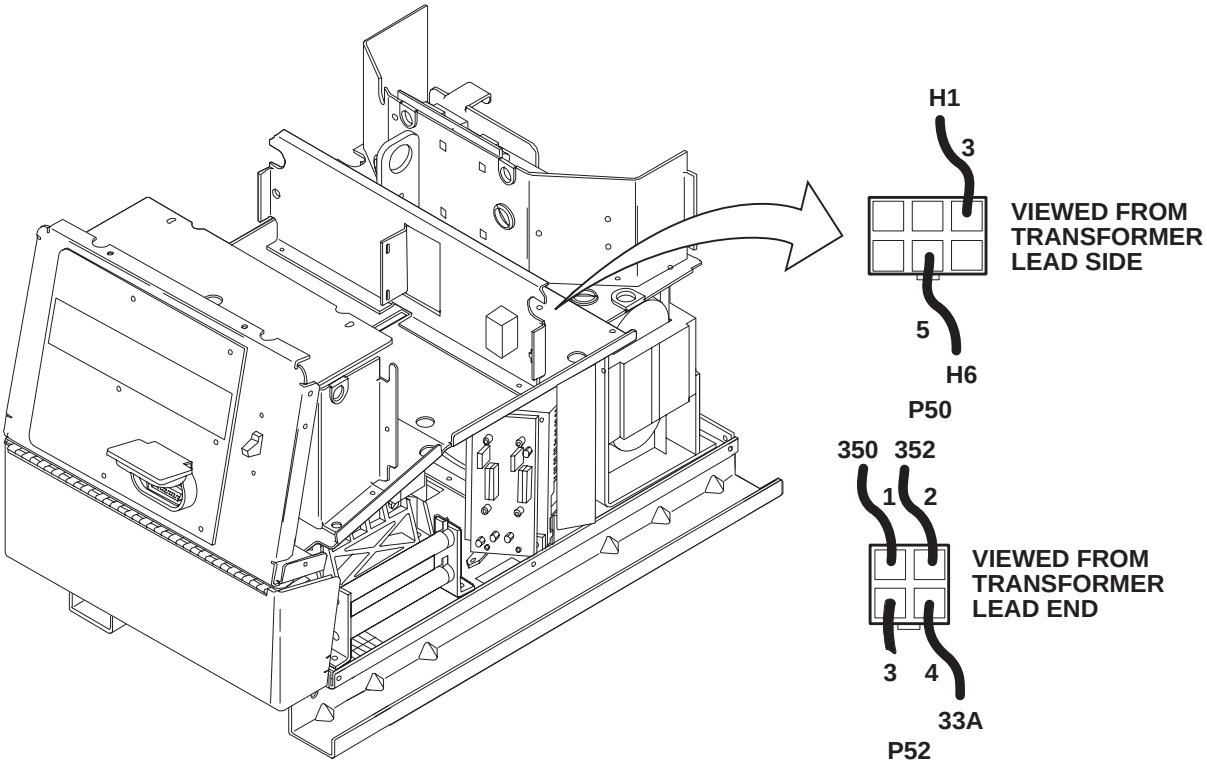
AUXILIARY TRANSFORMER NO. 2 TEST *(CONTINUED)*

FIGURE F.17 – AUXILIARY TRANSFORMER NO. 2 TEST



TEST PROCEDURE

1. Remove the main input power to the Power Wave 455M machine.
2. Remove any load that may be connected to the 115 VAC receptacle.
3. Using the 3/8" nut driver, remove the case top.
4. Locate plugs P52 and P50 at the Auxiliary Transformer No. 2. Refer to Figure F.17.
5. Carefully apply the correct input power.

⚠ WARNING

ELECTRIC SHOCK can kill.

High voltage is present at both plugs.

6. Check for 115 VAC at plug P52 pins 1 and 4 (leads 350 to 33A). Check for 230 VAC at plug P52 pins 1 and 2 (leads 350 to 352).
7. If 115 VAC and 230 VAC are present, Auxiliary Transformer No. 2 is good.
8. If 115 is not present between pins 1 and 4, and 230 VAC is not present between pins 1 and 2, check the associated leads and plugs for loose or faulty connections.
9. Carefully test for the correct AC input voltage applied to the primary windings at plug P50. See the Wiring Diagram.
10. If the correct AC input voltage is applied to the primary of the Auxiliary Transformer No. 2 and the secondary voltage is NOT correct, the transformer may be faulty. Replace.
11. Replace any cables ties and insulation removed earlier.
12. Install the case top using the 3/8" nut driver.

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INPUT RECTIFIER REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

DESCRIPTION

This procedure will aid the technician in the removal and replacement of the input rectifier module.

MATERIALS NEEDED

3/8” nut driver
3/16” Allen wrench
Phillips head screwdriver

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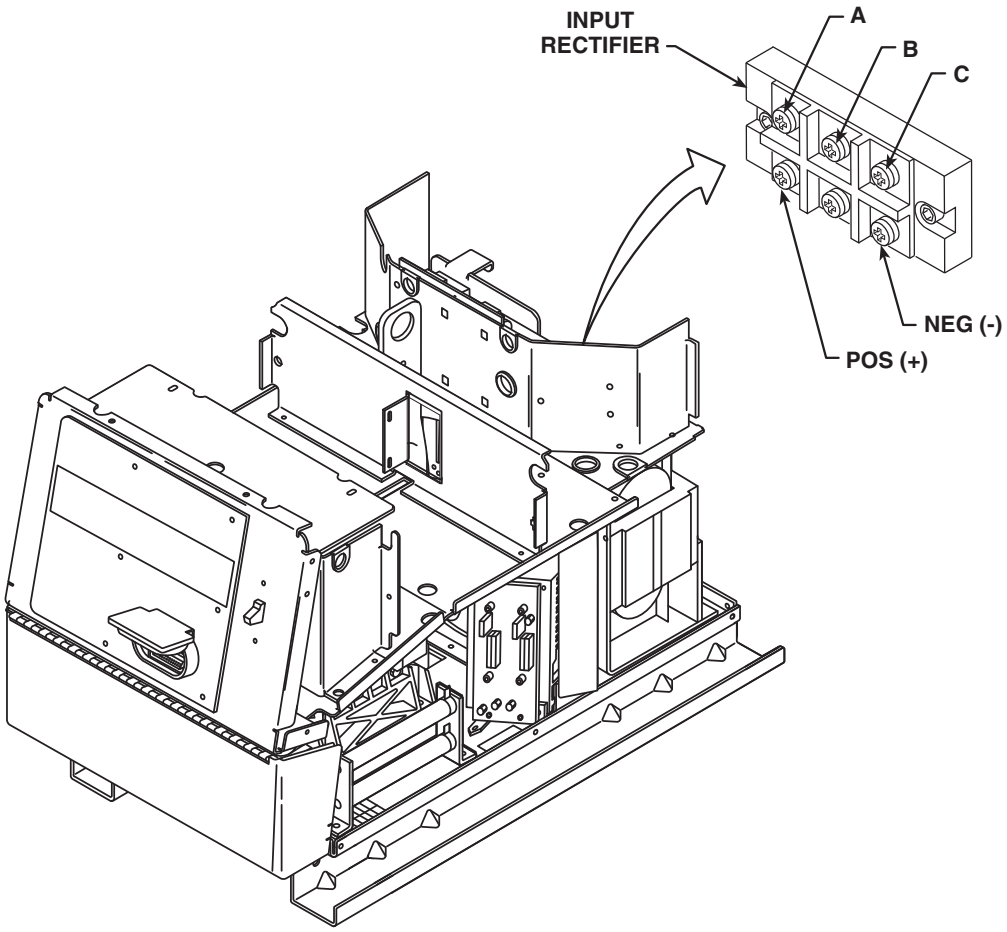
INPUT RECTIFIER REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.18 – INPUT RECTIFIER REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455M.
2. Using the 3/8” nut driver, remove the case top, and input access panel.
3. Perform the ***Capacitor Discharge*** procedure.
4. Locate and remove the RTV sealant from the input rectifier connection terminals. See Figure F. 18.
5. Label and, using the phillips head screwdriver, carefully remove the five leads from the input rectifier terminals. Note placement for reassembly. See Figure F.18.
6. Using the 3/16” allen wrench, remove the two mounting screws and washers from the rectifier module.
7. Carefully remove the input rectifier module.

REPLACEMENT PROCEDURE

1. Clean heat sink surfaces.
2. Apply an even coating of joint compound (Penetrox A-13) to both the heat sink and module mounting surfaces. The joint compound should be 0.002 - 0.005 in. thick per surface.
3. Mount the module to the heat sink and evenly torque the mounting screws (with washers) to 44 in/lbs.
4. Assemble the leads to the correct module terminals and torque to 26 in/lbs. See Figure F.18.
5. Apply RTV sealant to the rectifier connection terminals.
6. Install the case top, sides, and input access panel using the 3/8” nut driver.

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INPUT CONTACTOR REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the input contactor.

MATERIALS NEEDED

3/8” nut driver
5/16” nut driver
Phillips head screwdriver

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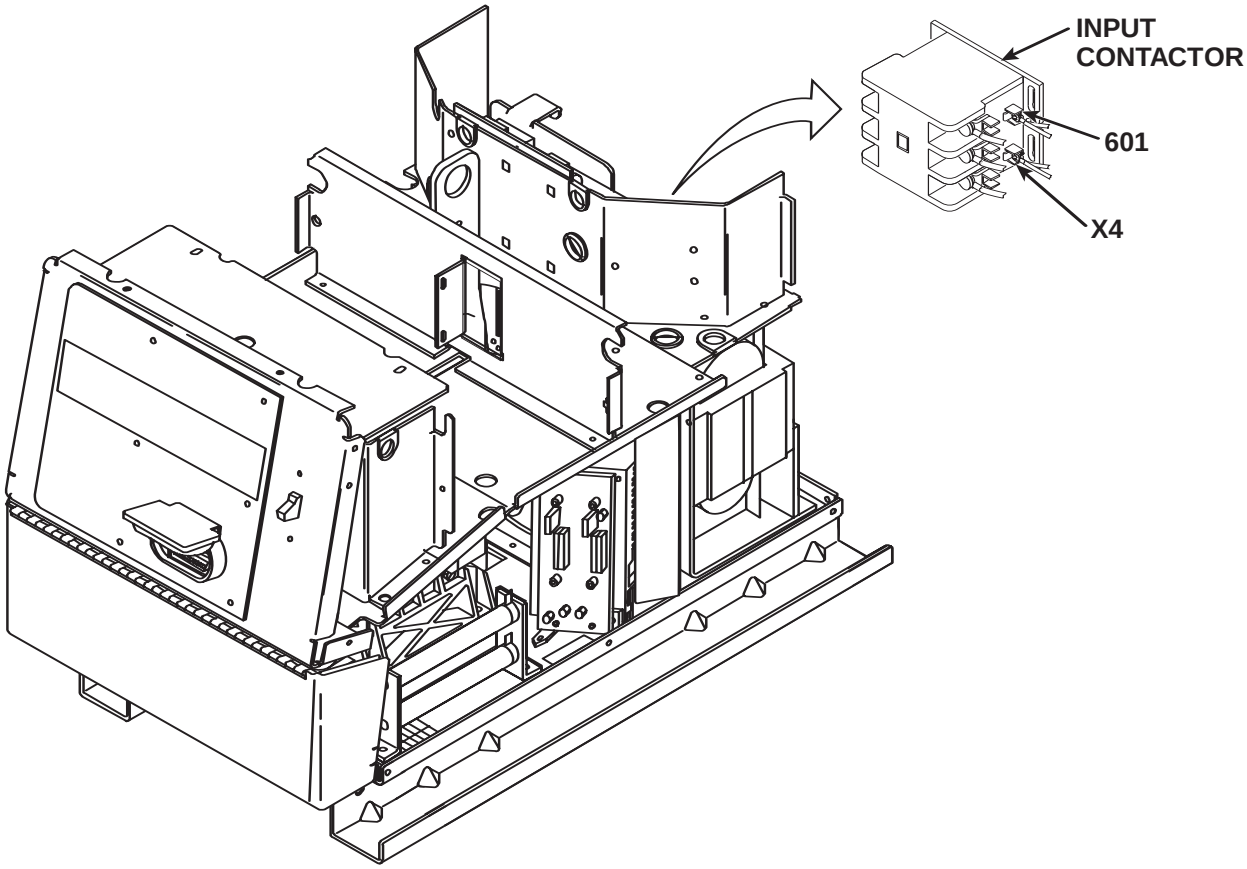
INPUT CONTACTOR REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.19 – INPUT CONTACTOR REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455M.
2. Using the 3/8” nut driver, remove the case top, and input access panel.
3. Perform the ***Capacitor Discharge*** procedure
4. Locate the input contactor. Label and, using the phillips head screwdriver, carefully remove the leads from the input contactor terminals. Note placement for reassembly. See Figure F.19.
5. With the 5/16” nut driver, remove the three mounting screws. See Figure F.19.
6. Carefully remove the input contactor.

REPLACEMENT PROCEDURE

1. Mount the contactor and tighten the mounting screws.
2. Assemble the leads to the correct terminals. See ***Figure F.18.***
3. Install the case top, sides, and input access panel using the 3/8” nut driver.

AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

DESCRIPTION

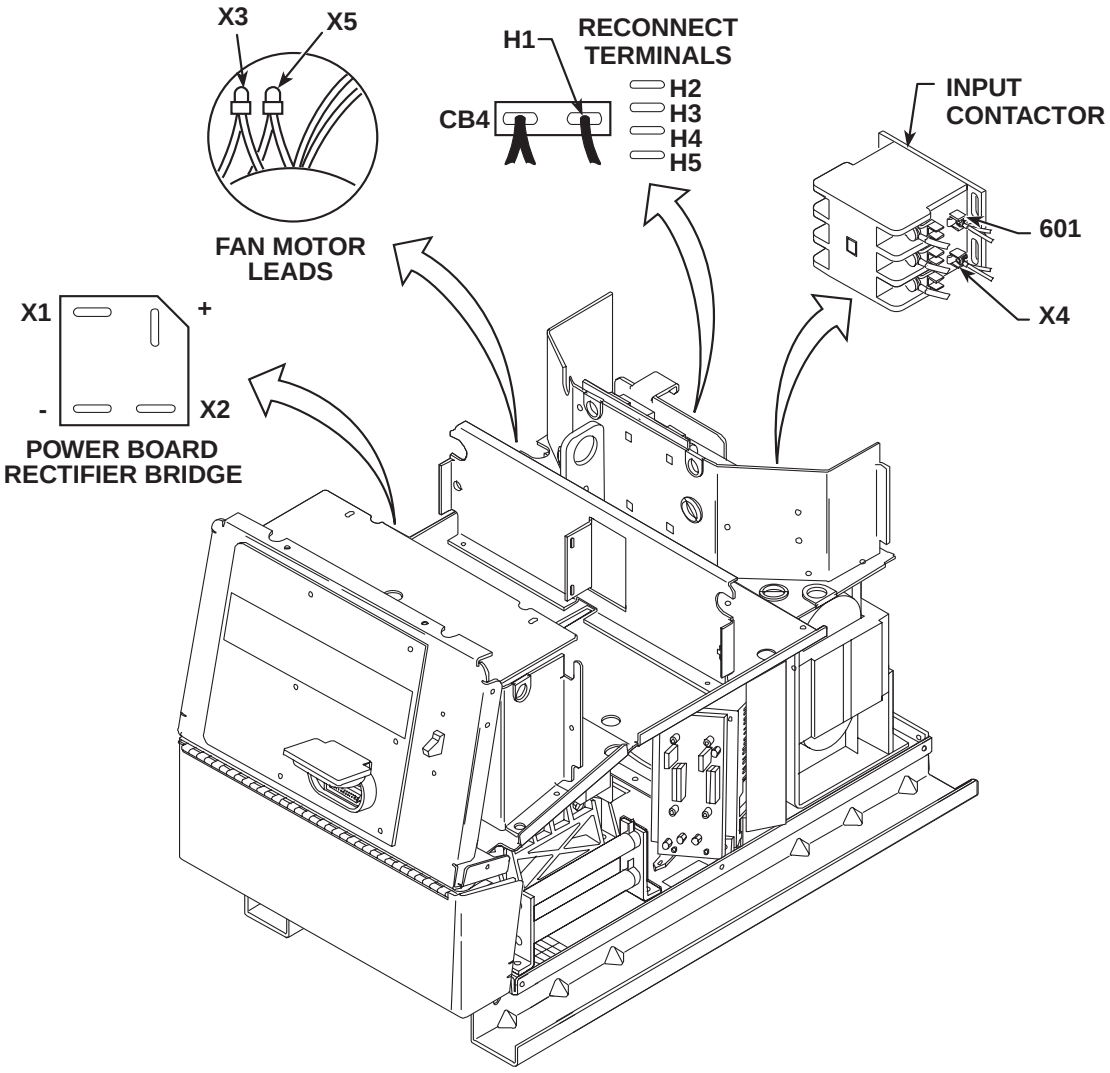
This procedure will aid the technician in the removal and replacement of auxiliary transformer No. 1.

MATERIALS NEEDED

3/8” Nut driver
Wire cutters
Wire splicer or soldering equipment

AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

FIGURE F.20 – AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8” nut driver, remove the case top, and input access panel.
3. Perform the ***Capacitor Discharge*** procedure.
4. Using the 3/8” nut driver, remove the case back.
5. Remove lead X4 from the input contactor coil terminal.

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AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

6. Remove leads X1 and X2 from the power board rectifier bridge. Refer to ***Figure F.20***.
7. Cut X3 and X5 from the fan motor leads. Leave enough lead length to splice in the new transformer leads.
8. Cut the X3 lead that is connected to the input board. Leave enough lead length to splice in the new transformer lead.
9. Locate, label, and remove primary lead H1 from circuit breaker CB4.
10. Label and remove primary leads H2, H3, H4, and H5 from the reconnect terminals on the reconnect panel. Note lead placement for reassembly.
11. Cut any necessary cable ties and clear the leads.
12. Using the 3/8” nut driver, remove the two mounting screws that hold the transformer to the fan baffle and the machine base.
13. Carefully remove the transformer from the Power Wave 455.

REPLACEMENT PROCEDURE

1. Carefully place the transformer into the Power Wave 455.
2. Install the two mounting screws that hold the transformer to the fan baffle and the machine base using the 3/8” nut driver.
3. Install the primary leads H2, H3, H4, and H5 to the reconnect terminals on the reconnect panel.
4. Connect primary lead H1 to circuit breaker CB4.
5. Splice the new transformer lead with the X3 lead connected to the input board.
6. Splice the new transformer fan leads to the fan motor leads X3 and X5.
7. Connect lead X4 to the main contactor coil terminal.
8. Connect leads X1 and X2 to the power board rectifier bridge.
9. Reposition any wire leads and install cable ties as necessary.
10. Install the case back using the 3/8” nut driver.
11. Install the case top, sides, and input access panel using the 3/8” nut driver.

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AUXILIARY TRANSFORMER NO. 2 REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of auxiliary transformer No. 2.

MATERIALS NEEDED

3/8” Nut driver
Wire cutters

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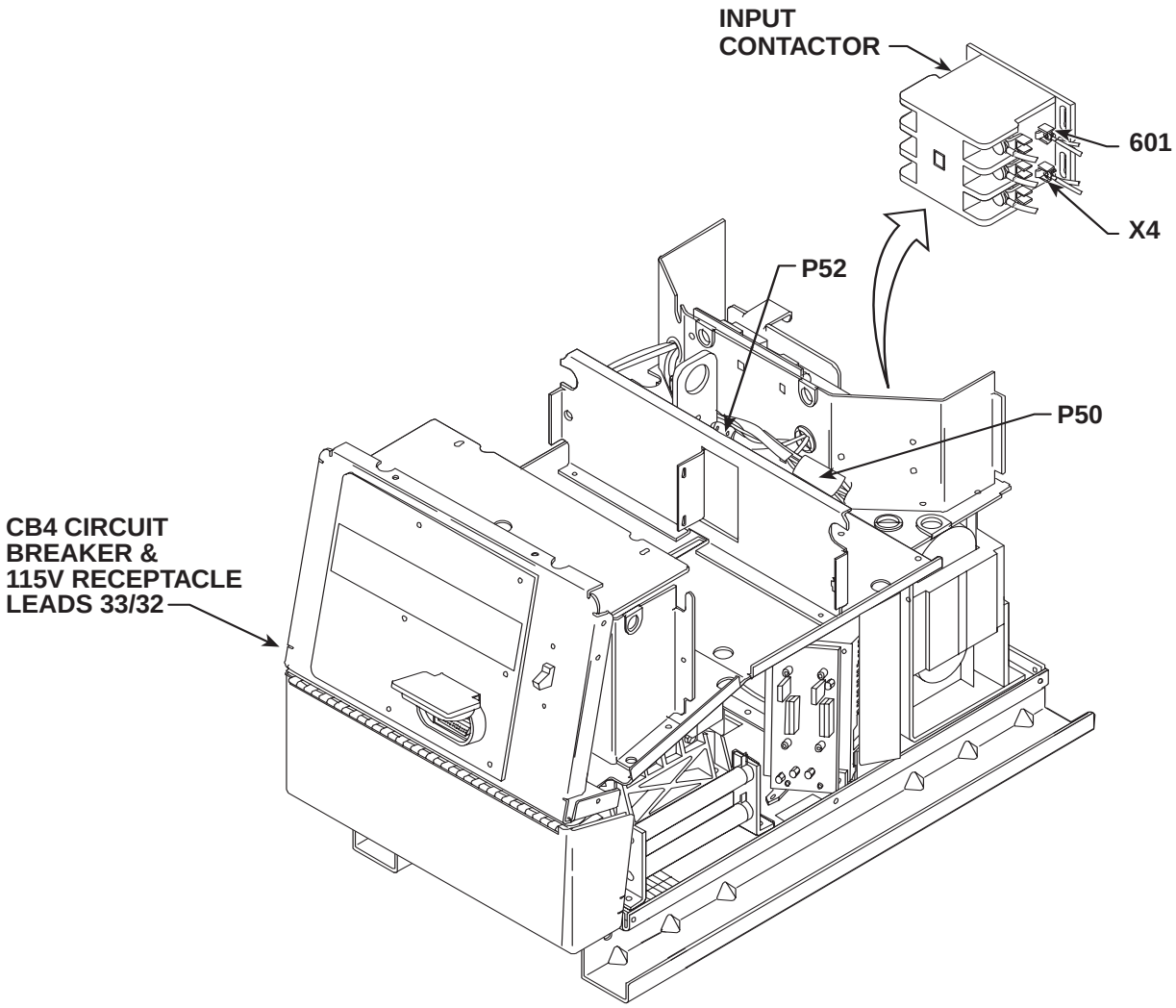
AUXILIARY TRANSFORMER NO. 2 REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

FIGURE F.21 – AUXILIARY TRANSFORMER NO. 2 REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8” nut driver, remove the case top, and input access panel.
3. Perform the ***Capacitor Discharge*** procedure.
4. Using the 3/8” nut driver, remove the case back.
5. Disconnect plugs P50 and P52.
6. Disconnect leads 33 and 32 to circuit breaker CB2 and the 115 V receptacle.
7. Using the 3/8” nut driver, remove the two transformer mounting screws.

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AUXILIARY TRANSFORMER NO. 2 REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

REPLACEMENT PROCEDURE

1. Carefully place the transformer into the Power Wave 455.
2. Install the two mounting screws that hold the transformer to the machine base using the 3/8” nut driver.
3. Connect leads 33 and 32 to circuit breaker CB4 and the 115 V receptacle.
4. Connect plugs P50 and P52.
5. Reposition any wire leads and install cable ties as necessary.
6. Install the case back using the 3/8” nut driver.
7. Install the case top, sides, and input access panel using the 3/8” nut driver.

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CONTROL, FEED HEAD, OR VOLTAGE SENSE PC BOARD REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

DESCRIPTION

This procedure will aid the technician in the removal and replacement of either the Control Board the Feed Head Board, or the Voltage Sense Board.

MATERIALS NEEDED

3/8” Nut driver
Anti-static wrist strap

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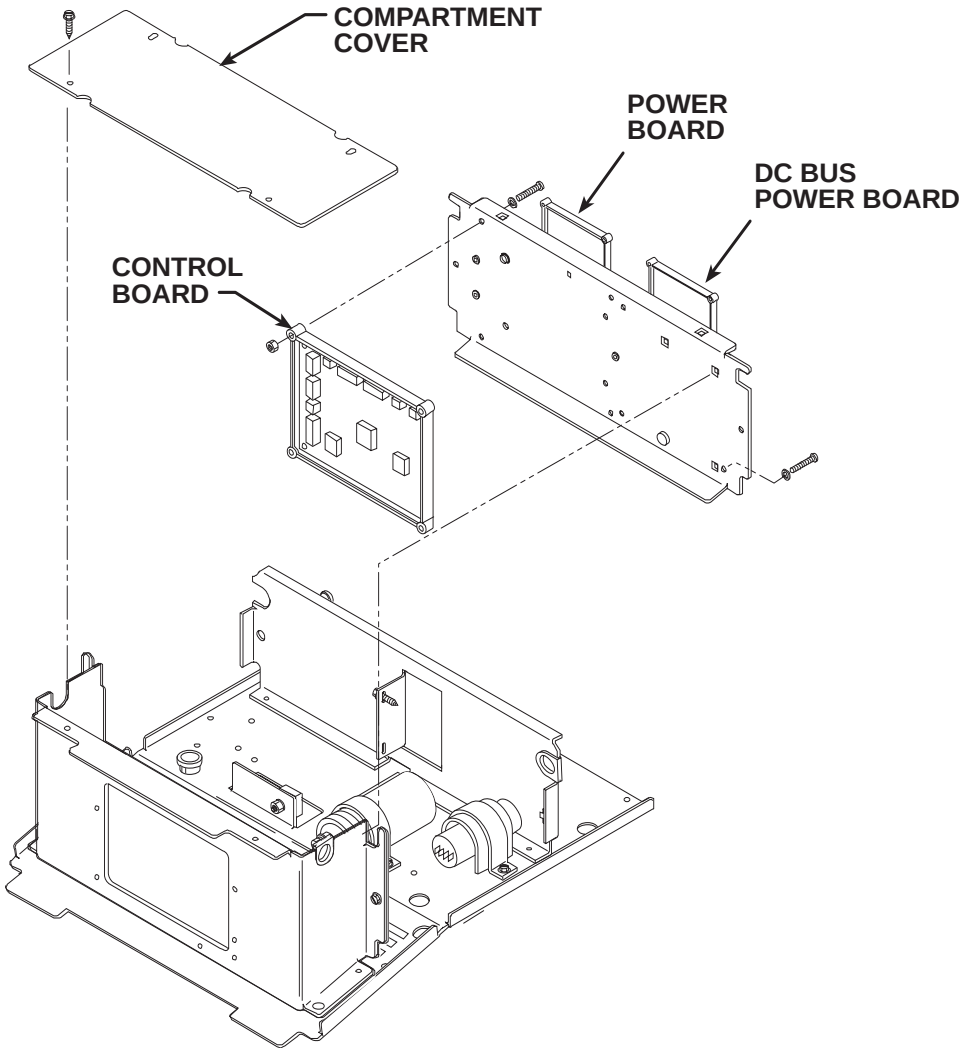
CONTROL, FEED HEAD, OR VOLTAGE SENSE PC BOARD REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.22 – CONTROL OR FEED HEAD BOARD REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455M.
2. Using the 3/8” nut driver, remove the case top.
3. Perform the ***Capacitor Discharge*** procedure.
4. Observe all static electricity precautions.
5. Using the 3/8” nut driver, remove the PC board compartment cover. Refer to Figure F.22.
6. Using the 3/8” nut driver, remove the two screws holding the rear of the Control Box in place.
7. Clear the leads in the sleeving and the grommets on the sides of the control box.
8. Label and remove the molex plugs from the Control Board and the Feed Head Board.

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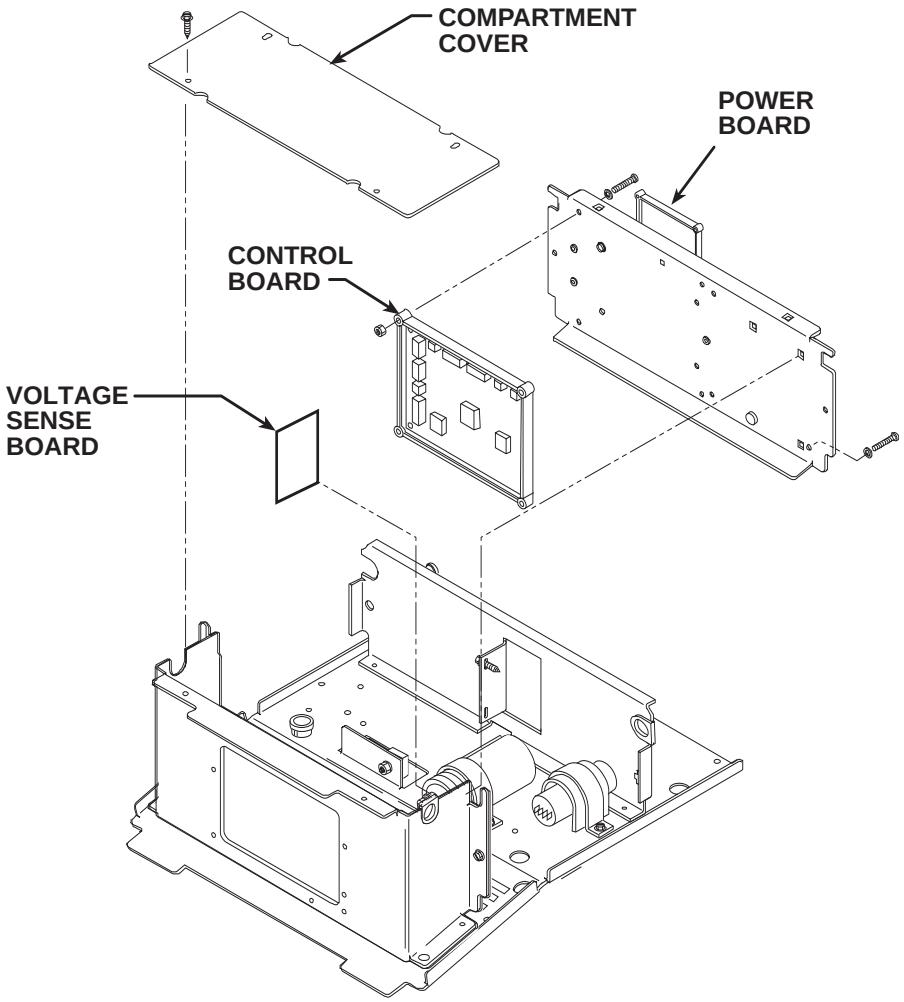
CONTROL, FEED HEAD, OR VOLTAGE SENSE PC BOARD REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.23 – VOLTAGE SENSE BOARD REMOVAL AND REPLACEMENT



9. Tilt back the rear of the control box to access the PC board mounting nuts. Using the 3/8" nut driver, remove the self-locking mounting nuts from the Control and Feed Head Boards. Carefully remove the boards.
10. Remove plugs J1 and J2 from the Voltage Sense Board. See Figure F.23.
11. Using the needle-nose pliers, carefully pinch the three plastic standoffs. Remove the Voltage Sense Board.

REPLACEMENT PROCEDURE

1. Install either the Control or the Feed Head Board to the back of the control box with the self-locking nuts. Use the 3/8" nut driver.
2. Connect the molex plugs to the Control Board and the Feed Head Board. Be sure the lead harnesses are securely and properly positioned.
3. Secure the rear of the control box in place using two screws and the 3/8" nut driver.

CONTROL, FEED HEAD, OR VOLTAGE SENSE PC BOARD REMOVAL AND REPLACEMENT *(CONTINUED)*

3. Secure the rear of the control box in place using two screws and the 3/8” nut driver.
4. Press the Voltage Sense Board onto its standoffs. Make sure the board snaps into place on all three standoffs.
5. Connect the two molex plugs to the Voltage Sense Board.
6. Install the PC board compartment cover using the 3/8” nut driver.
7. Install the case top and sides using the 3/8” nut driver.

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GATEWAY PC BOARD REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Gateway PC Board.

MATERIALS NEEDED

Phillips head screw driver
3/8” Nut driver
Anti-static wrist strap

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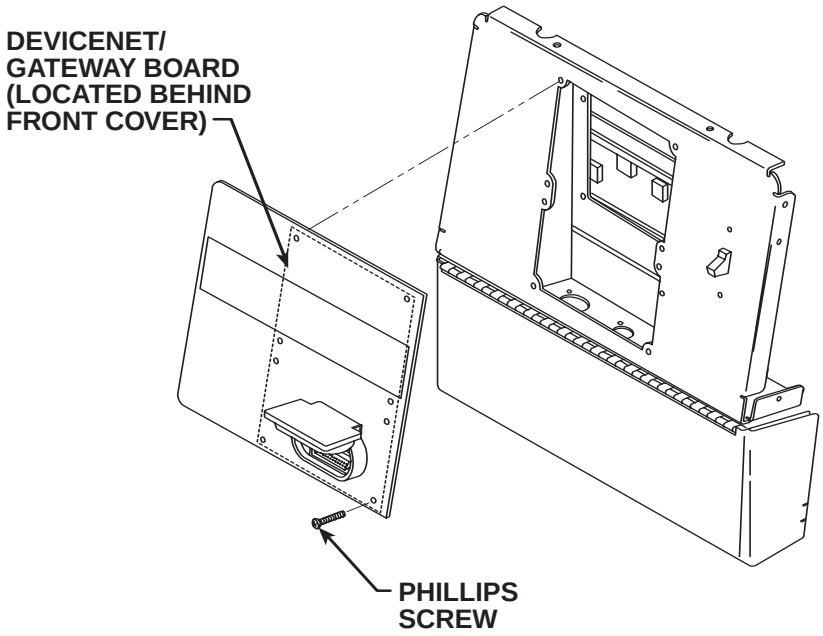
GATEWAY PC BOARD REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.24 – GATEWAY BOARD REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the phillips head screw driver, remove the six screws from the case front cover. Tilt open the cover and support it. See Figure F.24.
3. Observe all static electricity precautions.
4. Label and remove the four molex plugs from the Gateway Board.
5. Using the 3/8” nut driver, remove the self-locking mounting nuts from the Gateway Board. Carefully remove the board. Refer to Figure F.24.

REPLACEMENT PROCEDURE

1. Install the Gateway Board to the case front cover with the self-locking nuts. Use the 3/8” nut driver.
2. Connect the four molex plugs to the Gateway Board.
3. Using the phillips head screw driver, attach the cover to the case front.

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STT CURRENT TRANSDUCER REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

DESCRIPTION

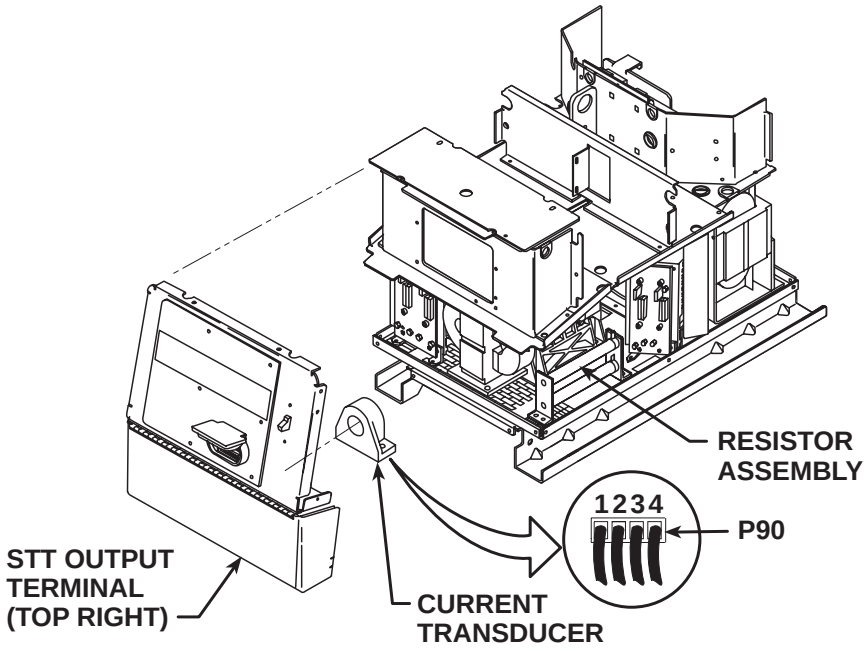
This procedure will aid the technician in the removal and replacement of the STT Current Transducer.

MATERIALS NEEDED

3/8” Nut driver
5/16” Open end wrench
5/16” Socket wrench with extension
Universal adapter
3/4” Wrench
Phillips head screw driver
Wire cutters
Wiring Diagram

STT CURRENT TRANSDUCER REMOVAL AND PLACEMENT *(CONTINUED)*

FIGURE F.25 – STT CURRENT TRANSDUCER REMOVAL AND REPLACEMENT PROCEDURE



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8” nut driver, remove the case top and right side.
3. Perform the ***Capacitor Discharge*** procedure.
4. Using the wire cutters, cut all cable ties to the transducer lead harness. Unplug the harness and swing it aside.
5. Label and remove the leads to the resistor assembly. See Figure F.25. Using the 5/16” socket wrench, extension and universal adapter, remove the resistor assembly. It may be necessary to remove the plastic high voltage protection shield. (Use the 3/8” nut driver.) It may also be necessary to use a 5/16” open end wrench to remove the inside screws. Carefully swing the resistor assembly aside.

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STT CURRENT TRANSDUCER REMOVAL AND REPLACEMENT *(CONTINUED)*

6. With the 5/16” open end wrench, remove the small screw from the STT output terminal. Label and remove the small leads. See the Wiring Diagram.
7. Using the 3/4” wrench, remove the bolt, lock washer and flat washer from the STT output terminal. Remove the double heavy output leads. Cut any necessary cable ties.
8. Using the phillips head screw driver, remove the screws and lock washers that hold the transducer to the front panel.
9. Remove the STT current transducer, carefully feeding the output leads through it.
10. Remove the standoffs from the transducer and save them for reassembly with the new transducer.

REPLACEMENT PROCEDURE

1. Attach the standoffs to the transducer.
2. Position the transducer on the back of the front panel and attach it with the two phillips screws and lock washers. Feed the output leads through the transducer.
3. Attach the double heavy leads to the STT output terminal with the 3/4” bolt, lock washer and flat washer.
4. Attach the small leads to the STT output terminal with the 5/16” screw.
5. Install the resistor assembly using the 5/16” socket wrench, extension and universal adapter. Install the plastic high voltage protection shield with the 3/8” nut driver.
6. Replace all cable ties cut during removal.
7. Install the case top and right side using the 3/8” nut driver.

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POWER WAVE CURRENT TRANSDUCER REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

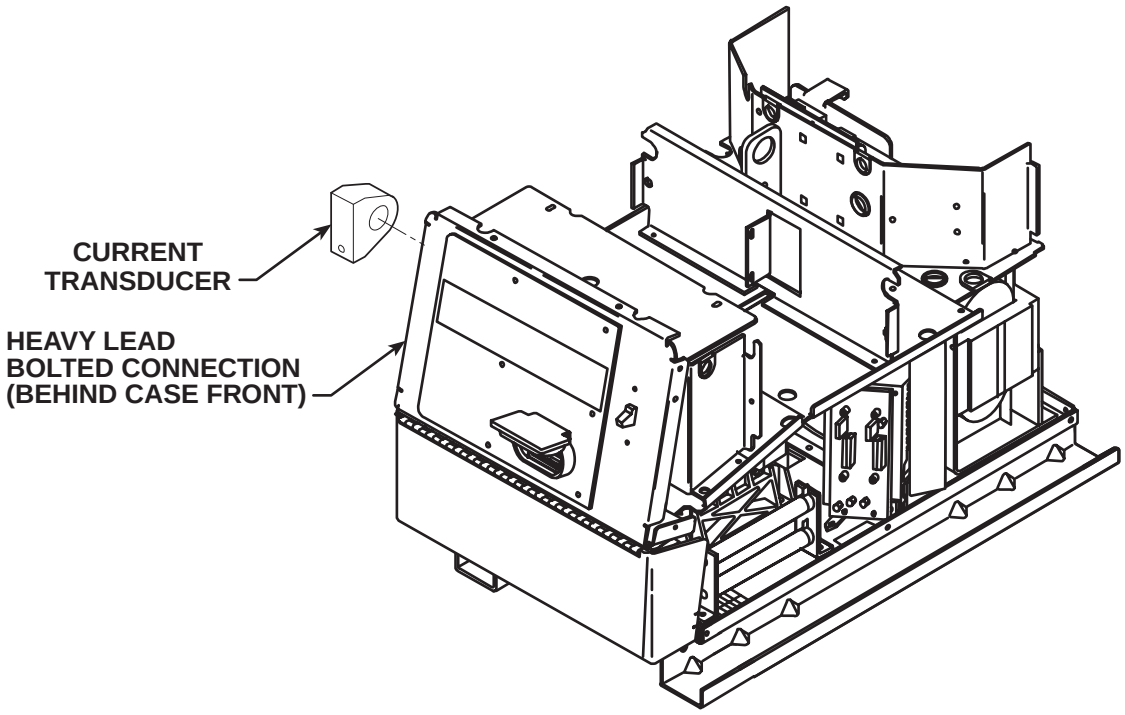
This procedure will aid the technician in the removal and replacement of the Power Wave Current Transducer.

MATERIALS NEEDED

3/8” Nut driver
5/16” Open end wrench
9/16” Wrench
3/4” Wrench
Phillips head screw driver
Wire cutters
Wiring Diagram

POWER WAVE CURRENT TRANSDUCER REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.26 – POWER WAVE CURRENT TRANSDUCER REMOVAL AND REPLACEMENT PROCEDURE



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8” nut driver, remove the case top and sides and the control box cover.
3. Perform the ***Capacitor Discharge*** procedure.
4. Using the 3/8” socket wrench or nut driver, remove the three screws along the bottom case front. See Figure F.26.
5. Using the 3/8” socket wrench, remove the four screws that hold the case front to the machine.
6. Label all leads to all output terminals. Using the 5/16” wrench and the 3/4” wrench, remove all leads from the three output terminals. See the Wiring Diagram.
7. Cut any necessary cable ties. Then carefully swing the front panel aside.
8. Remove the insulating tape from the heavy lead bolted connection. See Figure F.26. Using the 9/16” wrenches, remove the bolt, lock washer and nut.

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POWER WAVE CURRENT TRANSDUCER REMOVAL AND REPLACEMENT *(CONTINUED)*

9. Using the phillips head screw driver, remove the screws and lock washers that hold the transducer to the front panel.
10. Remove the Power Wave current transducer.
11. Remove the standoffs from the transducer and save them for reassembly with the new transducer.

REPLACEMENT PROCEDURE

1. Attach the standoffs to the transducer.
2. Position the transducer on the back of the front panel and attach it with the two phillips screws and lock washers. Feed the output leads through the transducer.
3. Run the heavy lead through transducer and secure the bolted connection with the 9/16” bolt, lock washer and nut. Replace the insulating tape around the connection.
4. Using the 5/16” wrench and the 3/4” wrench, attach all leads to the three output terminals. See the Wiring Diagram.
5. Replace all cable ties cut during removal.
6. Install the case top and sides using the 3/8” nut driver.

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OUTPUT RECTIFIER, STT CHOPPER BOARD AND RECTIFIER MODULE REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the output rectifier assembly and individual rectifier module replacement.

This procedure takes approximately 35 minutes to remove and replace the output rectifier, 5 minutes to remove the STT Chopper Board and 5 minutes to remove and replace the rectifier module.

MATERIALS NEEDED

3/8” Nut driver
7/16” Wrench
9/16” Wrench
9/64” Allen wrench
3/16” Allen wrench
Needle-nose pliers
Slot head screwdriver
Penetrox A13 Thermal Joint Compound
Wiring Diagram

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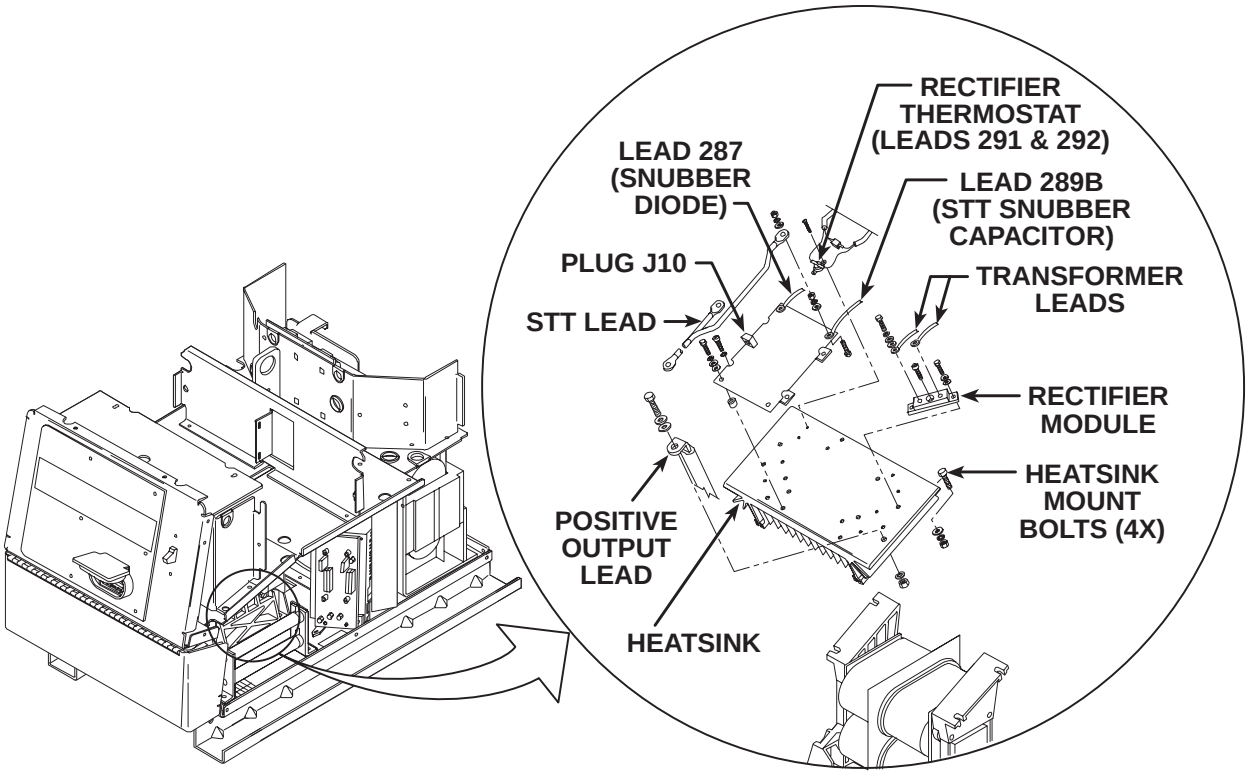
OUTPUT RECTIFIER, STT CHOPPER BOARD AND RECTIFIER MODULE REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.27 – OUTPUT RECTIFIER, STT CHOPPER BOARD AND RECTIFIER MODULE REMOVAL AND REPLACEMENT



RECTIFIER ASSEMBLY REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455.
2. Using the 3/8” nut driver, remove the case top and sides.
3. Perform the ***Capacitor Discharge*** procedure.
4. Using the 9/16” wrench, remove the Power Wave positive output lead from the rectifier heat sink. Note fastener hardware for reassembly. Refer to Figure F.27.
5. Using the 7/16” wrench, remove the STT output lead from the rectifier heat sink. Note fastener hardware for reassembly. Refer to Figure F.27.
6. Using the 7/16” wrench, remove the eight transformer leads from the rectifier modules. Label the leads and take note of lead placement for reassembly. Note that each screw has two flat washers and one lock washer.

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OUTPUT RECTIFIER, STT CHOPPER BOARD AND RECTIFIER MODULE REMOVAL AND REPLACEMENT *(CONTINUED)*

7. Using the needle-nose pliers, remove leads #292 and #291 from the rectifier thermostat.
8. Disconnect plug J10 from the STT Chopper Board.
9. With the 7/16” wrench, remove lead #287 from the STT Snubber Diode D5.
10. With the 7/16” wrench, remove lead #289B from the STT Snubber Capacitor C10.
11. Using the 7/16” wrench, remove the four nuts and associated washers from the heat sink mounting bolts. The heat-sink assembly can be removed by carefully sliding the assembly forward and removing the mounting bolts.

STT CHOPPER BOARD REMOVAL AND REPLACEMENT PROCEDURE

1. Place the output rectifier assembly on a clean bench surface.
2. Using a slot head screw driver, remove the two nylon screws holding the board to the heat sink. Save the standoffs for reassembly.
3. Using the 7/16” wrench, remove the two bolts, lock washers and flat washers. Save the standoffs for reassembly.
4. Using the 3/16” allen wrench, remove the four screws and lock washers holding the board to the heat sink.
5. Carefully remove the STT Chopper Board.

REPLACEMENT PROCEDURE

1. Position the new board on the heat sink, using the standoffs for the slot head nylon screws and the allen head screws.
2. Install the four 3/16” allen head screws and lock washers.
3. Install the two nylon slot head screws.
4. Install the two 7/16” bolts, lock washers and flat washers.

OUTPUT RECTIFIER, STT CHOPPER BOARD AND RECTIFIER MODULE REMOVAL AND REPLACEMENT *(CONTINUED)*

RECTIFIER MODULE REMOVAL AND REPLACEMENT PROCEDURE

1. Using the 9/64” allen wrench, remove the cap screw from the center of the rectifier module that is to be replaced.
2. Using the 7/16” wrench, remove the two mounting bolts and associated washers from the rectifier module to be replaced.
3. Remove the faulty module.
4. This module requires special mounting considerations to prevent warping of the base plate. The heat sink surfaces must be clean and flat. Apply a thin, even coating of thermal compound, (Penetrox A13) 0.004 to 0.010 inches thick. Keep the compound away from the area of the mounting holes.
5. Press the new module firmly against the heat sink while aligning the mounting holes. Start all three screws two to three turns by hand.
6. Tighten each of the outer screws to between 5 and 10 in-lbs.
7. Tighten the center screw to between 12 and 18 in-lbs.
8. Tighten each of the outer screws again, this time to between 30 and 40 in/lbs.

RECTIFIER ASSEMBLY REPLACEMENT PROCEDURE

1. Position the assembly in place with the mounting bolts.
2. Assemble the nuts and associated washers to the mounting bolts.
3. Using the 7/16” wrench, tighten the four nuts on the mounting bolts.
4. Replace leads #292 and #291 to the thermostat.
5. Connect plug J10 to the STT Chopper Board.
6. With the 7/16” wrench, attach lead #287 from the STT Snubber Diode D5.
7. With the 7/16” wrench, attach lead #289B from the STT Snubber Capacitor C10.
8. Connect the eight transformer leads to the correct rectifier modules. Tighten the screws (with two flat washers and one lock washer) to between 30 and 40 in/lbs. **Do not stress the terminals when making these connections.**
9. Apply a thin coat of Penetrox A13 to the heat sink where the Power Wave positive output lead and the STT output lead attach.
10. Attach the Power Wave positive output lead to the heat sink using the 9/16” wrench.
11. Attach the STT output lead to the heat sink using the 7/16” wrench.
12. Install the case top and sides using the 3/8” nut driver.

Return to Section TOC
Return to Master TOC

SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electric troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the switch board(s) and/or filter capacitor(s).

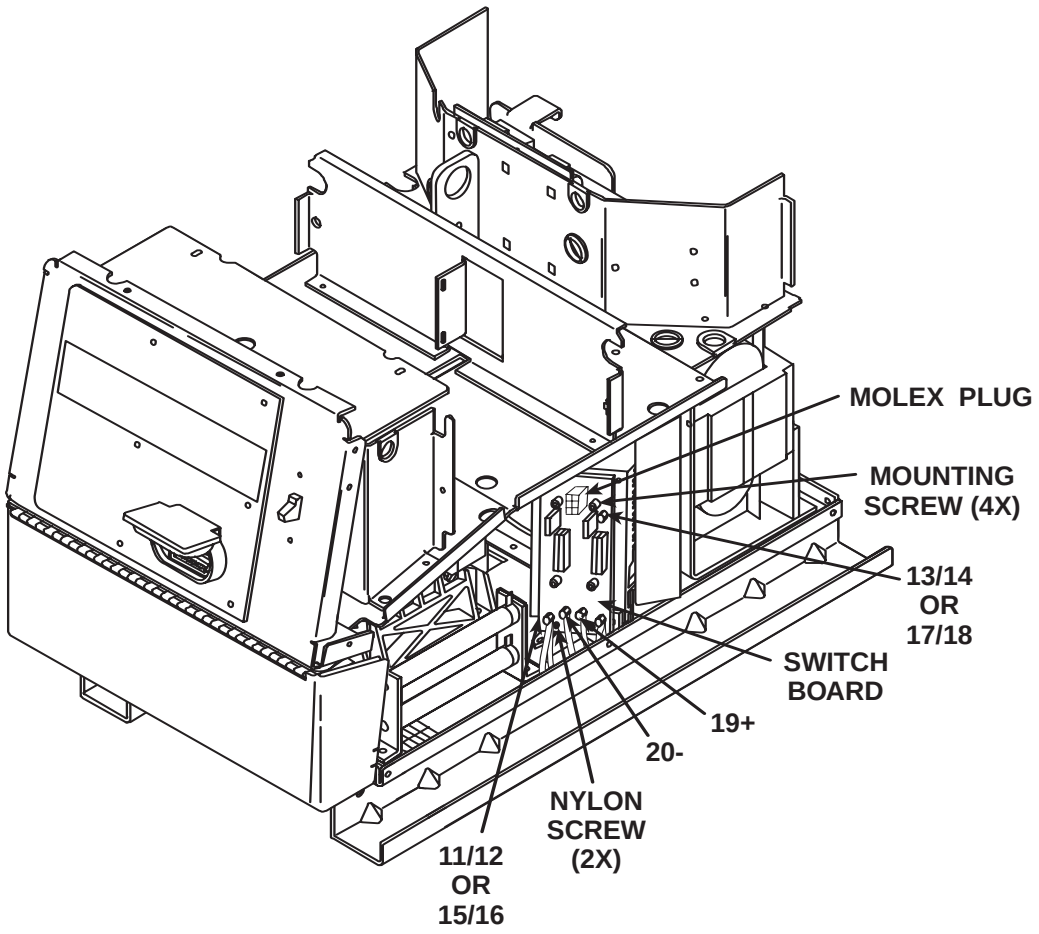
MATERIALS NEEDED

3/8” Nut driver
7/16” Wrench
3/16” Allen wrench
Slot head screwdriver
Penetrox A13 thermal joint compound

Return to Section TOC
Return to Master TOC

SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.28 – SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

NOTE: Observe all static electricity precautions.

Lead and plug references below use a slash (/) to indicate machine right side/left side wire number differences.

1. Remove input power to the Power Wave 455.
2. Using the 3/8” nut driver, remove the case top.
3. Perform the ***Capacitor Discharge*** procedure.
4. Using the 5/16” nut driver, remove the three screws mounting the plastic high voltage protective shield. Remove the shield.
5. Remove molex plug J40/J50 from the top of the switch board. Refer to Figure F.28.
6. Remove the mylar insulating shield covering leads 13/14 or 17/18. Cut the cable tie.

Return to Section TOC
Return to Master TOC

SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT *(CONTINUED)*

7. Using the 7/16” wrench, remove leads 13/14 or 17/18 from the switch board.
8. Using the 7/16” wrench, remove leads 11/12 or 15/16 from the switch board.
9. Using the 7/16” wrench, remove leads 19C/D+ and 20C/D- from the switch board capacitor connection bolts.
10. With the slot head screwdriver, remove the two nylon mounting screws at the bottom of the switch board. Note placement of the shake-proof washers and fiber spacers.
11. Using the 3/16” allen wrench, carefully remove the four cap screws that mount the switch board to the heat sink.
12. Carefully remove the switch board from the heat sink.
13. If the filter capacitor is to be removed, carefully slide it out of the mounting bracket.

REPLACEMENT PROCEDURE

1. If the filter capacitor is to be replaced, carefully slide the new capacitor into the mounting bracket. Position the capacitor so the correct polarity terminal is lined up with the correct hole on the switch board.
2. All heat sink and IGBT mounting surfaces must be clean.
3. Apply a thin coat of thermal compound (Penetrox A13) 0.005 to 0.010 inches thick to the mating surfaces. Do not apply around mounting holes.
4. Apply a thin coat of Penetrox A13 to the capacitor terminals. Be careful not to apply compound to screw threads or threaded area of terminals.
5. Mount the new switch board and tighten the four cap head screws in the following manner.

   Tighten all until snug.

   Tighten all from 24 to 28 in-lbs.

   Tighten all from 40 to 48 in-lbs.
6. Make sure the capacitor is positioned correctly. Connect leads 19C/D+ and 20C/D- to the correct terminals. Tighten to 55 in/lbs.
7. Position and mount the two nylon screws, fiber spacers, and washers. Torque from 4 to 8 in-lbs.
8. Connect leads 11/12 or 15/16 to the correct terminal.
9. Connect leads 13/14 or 17/18 to the correct terminal.
10. Install the mylar insulating shield covering leads 11/12 or 15/16. Replace the cable tie.
11. Connect molex plug J40/J50 to the top of the switch board.
12. Using the 5/16” nut driver, install the plastic high voltage protective shield.
13. Install the case top and sides using the 3/8” nut driver.

Return to Section TOC
Return to Master TOC

RETEST AFTER REPAIR

Retest a machine:

If it is rejected under test for any reason that requires you to remove any part which could affect the machine's electrical characteristics.

OR

If you repair or replace any electrical components.

INPUT IDLE AMPS AND WATTS

Input Volts/Hertz	Maximum Idle Amps	Maximum Idle KW
208/60	4.0	0.45
230/60	3.3	0.45
400/60	2.1	0.45
460/60	2.0	0.45
575/60	1.8	0.45

MAXIMUM OUTPUT VOLTAGES

Input Volts/Hertz	Output Terminals - No load	X1 - X2 Aux. Trans #1	115 Volt Receptacles	
208/60 230/60 400/60 460/60 575/60	50-70 VDC	48.5 - 55 VDC	OCV 115 - 123 VAC	10 Amp Load 111 - 119 VAC

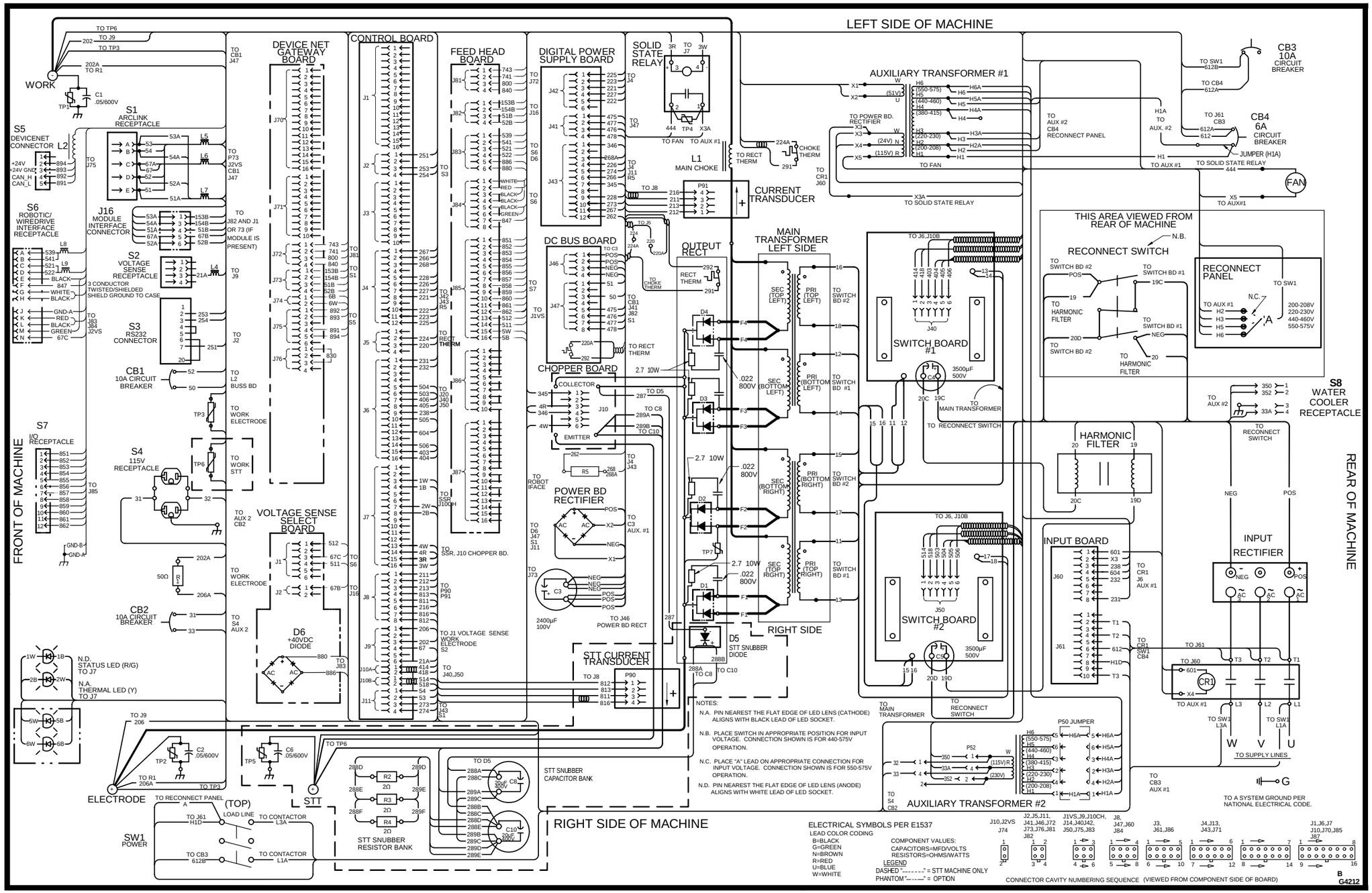
Section G-1

TABLE OF CONTENTS
- ELECTRICAL DIAGRAMS SECTION -

NOTE: Many PC Board Assemblies are now totally encapsulated and are therefore considered to be unserviceable. The Assembly drawings are provided for reference only.

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

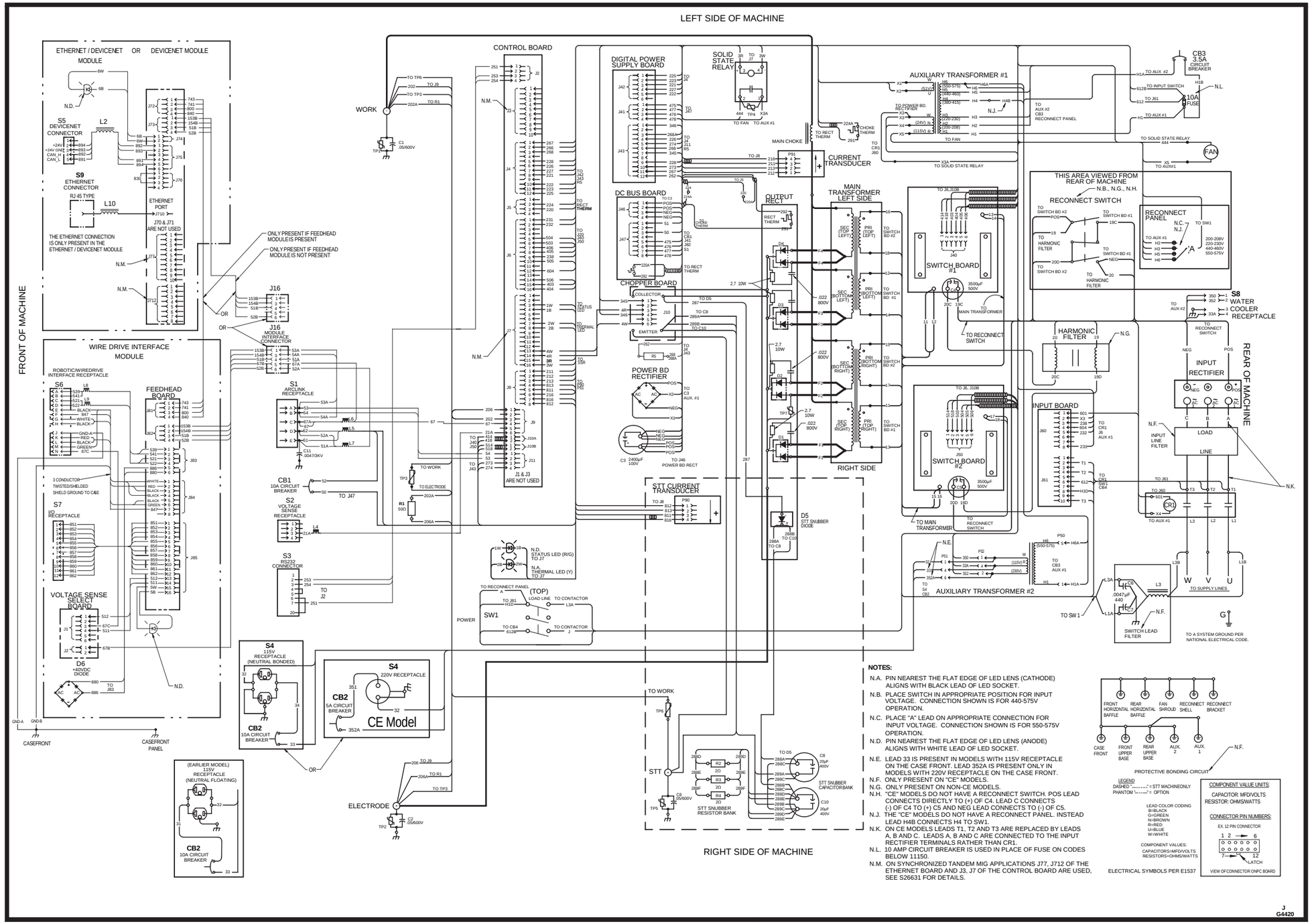
WIRING DIAGRAM - ENTIRE MACHINE - CODE 10942 (G4212)



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

Return to Section TOC
Return to Master TOC

WIRING DIAGRAM - ENTIRE MACHINE - CODES 10957 - 11311 (G4420)



NOTES:

N.A. PIN NEAREST THE FLAT EDGE OF LED LENS (CATHODE) ALIGNS WITH BLACK LEAD OF LED SOCKET.

N.B. PLACE SWITCH IN APPROPRIATE POSITION FOR INPUT VOLTAGE. CONNECTION SHOWN IS FOR 440-575V OPERATION.

N.C. PLACE "A" LEAD ON APPROPRIATE CONNECTION FOR INPUT VOLTAGE. CONNECTION SHOWN IS FOR 550-575V OPERATION.

N.D. PIN NEAREST THE FLAT EDGE OF LED LENS (ANODE) ALIGNS WITH WHITE LEAD OF LED SOCKET.

N.E. LEAD 33 IS PRESENT IN MODELS WITH 115V RECEPTACLE ON THE CASE FRONT. LEAD 352A IS PRESENT ONLY IN MODELS WITH 220V RECEPTACLE ON THE CASE FRONT.

N.F. ONLY PRESENT ON "CE" MODELS.

N.G. ONLY PRESENT ON NON-CE MODELS.

N.H. "CE" MODELS DO NOT HAVE A RECONNECT SWITCH. POS LEAD CONNECTS DIRECTLY TO (+) OF C4. LEAD C CONNECTS (-) OF C4 TO (+) C5 AND NEG LEAD CONNECTS TO (-) OF C5.

N.J. THE "CE" MODELS DO NOT HAVE A RECONNECT PANEL. INSTEAD LEAD H4B CONNECTS H4 TO SW1.

N.K. ON CE MODELS LEADS T1, T2 AND T3 ARE REPLACED BY LEADS A, B AND C. LEADS A, B AND C ARE CONNECTED TO THE INPUT RECTIFIER TERMINALS RATHER THAN CR1.

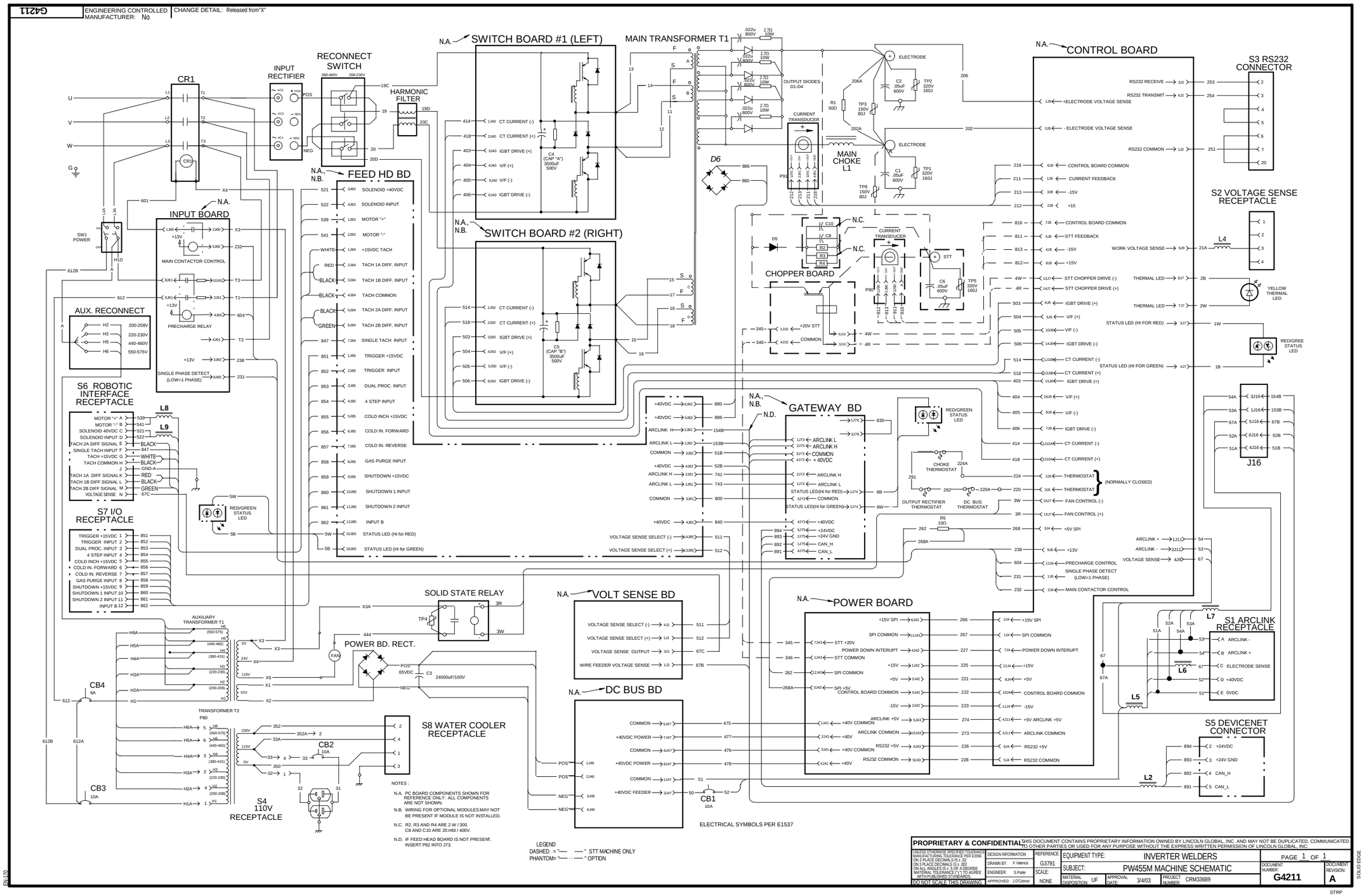
N.L. 10 AMP CIRCUIT BREAKER IS USED IN PLACE OF FUSE ON CODES BELOW 11150.

N.M. ON SYNCHRONIZED TANDEM MIG APPLICATIONS J77, J712 OF THE ETHERNET BOARD AND J3, J7 OF THE CONTROL BOARD ARE USED, SEE S26631 FOR DETAILS.

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

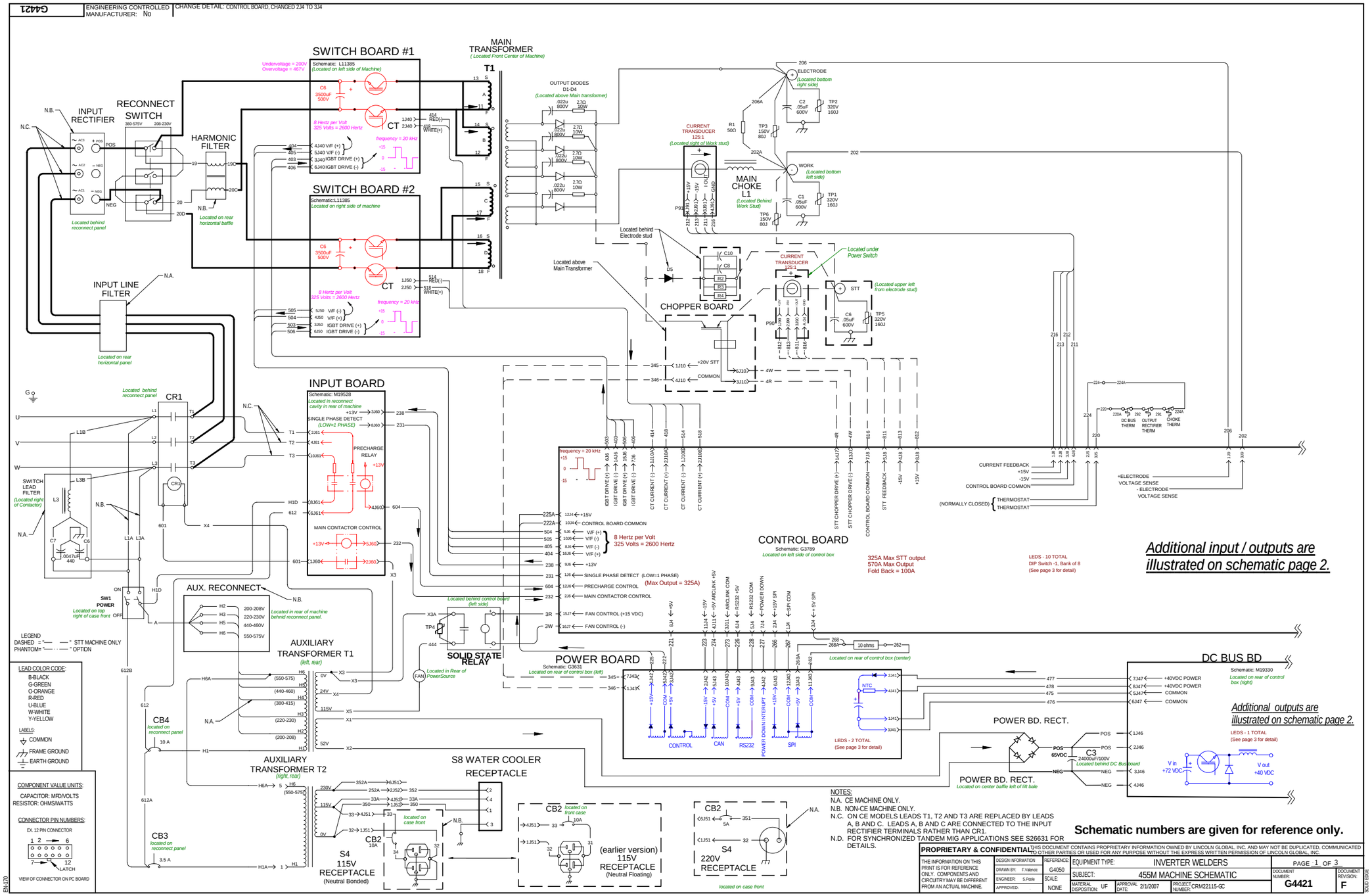
Return to Section TOC
Return to Master TOC

SCHEMATIC - ENTIRE MACHINE - CODE 10942 (G4211)



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - ENTIRE MACHINE - CODES 10957 - 11311 PG 1 OF 3 (G4421)



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
Return to Master TOC

SCHEMATIC - ENTIRE MACHINE - CODES 10957 - 11311 PG 2 OF 3 (G4421)

G4421 | ENGINEERING CONTROLLED | MANUFACTURER: No | CHANGE DETAIL: CONTROL BOARD, CHANGED 234 TO 334

CONTROL BOARD

Schematic: G3789
Located on left side of control box

YELLOW THERMAL LED — 2B — 827 — THERMAL LED
2W — 727 — THERMAL LED
Located by power switch, See page 3 for details
RED/GREEN STATUS LED — 1W — 327 — STATUS LED (HI FOR RED)
1B — 427 — STATUS LED (HI FOR GREEN)

LEDS - 10 TOTAL
DIP SWITCH - 1 BANK OF 8
SEE PAGE 3 FOR DETAILS

S3 RS232 CONNECTOR
2 — 253 — 253 — 322 — RS232 RECEIVE
3 — 254 — 254 — 422 — RS232 TRANSMIT
4, 5, 6, 7 — 251 — 251 — 122 — RS232 COMMON
20
Located under spring loaded cover see page 3 for details

CONTROL BOARD

S2 VOLTAGE SENSE RECEPTACLE
1, 2, 3, 4
Located under spring loaded cover See page 3 for details
L4
21A — 21A — 639 — WORK VOLTAGE SENSE

GROUND LEAD CURRENT SENSOR
C422-1 — 336 — GROUND CURRENT SENSE
C422-2 — 1136 — GROUND CURRENT SENSE
CURRENT SENSOR CLOSED IS THE FAULT CONDITION
Located on vertical panel near lift bale
N.F.

Additional input / outputs are illustrated on schematic # 1.

VOLTAGE SENSE — 439 — 67
ARC LINK H — 1211 — 54
ARC LINK L — 2211 — 53

DC BUS BD

Schematic: M19330
Located on rear of control box (right)

Additional input / outputs are illustrated on schematic # 1.

LEDS - 1 TOTAL
SEE PAGE 3 FOR DETAILS

0 VDC — 1347 — 51
+40VDC FEEDER — 3347 — 50
CB1 10A *located on lower left case front* — 52

ETHERNET/DEVICENET OR DEVICENET BOARD

(ETHERNET/DEVICENET BOARD SHOWN)

Schematic: G3893
Located on rear, left side of front door see page 3 for details

ETHERNET/DEVICENET
LEDS - 12 TOTAL
DIP SWITCH - 4 BANKS OF 8
SEE PAGE 3 FOR DETAILS

DEVICENET
LEDS - 9 TOTAL
DIP SWITCH - 2 BANKS OF 8
SEE PAGE 3 FOR DETAILS

ETHERNET PORT — 3710
L10
ETHERNET CONNECTOR (Ethernet Board only)
Located under spring loaded cover
RJ45 type

+24VDC — 5375 — 894
0 VDC — 2375 — 893
CAN_H — 1375 — 892
CAN_L — 4375 — 891
L2
S5 DEVICENET CONNECTOR
894 — 2 — +24VDC
893 — 3 — 0 VDC
892 — 4 — CAN_H
891 — 5 — CAN_L
Located under spring loaded cover, See page 3 for details

830 — 1276 — ETHERNET/DEVICENET BOARD ONLY
3276 — DEVICENET CONFIGURATION MUST BE IN FOR DEVICENET

RED/GREEN STATUS LED
6B — 1274 — (HIGH for RED)
6W — 2274 — (HIGH for GREEN)

ARCLINK L
ARCLINK H
0 VDC
+40VDC
1375, 2375, 3375, 4375
743

ARCLINK L — 3J73
ARCLINK H — 4J73
ARCLINK L — 1J73
ARCLINK H — 2J73
N.C.

VOLT SENSE BD

Schematic:S24779
Located on rear, right side of front door see page 3 for details
VOLTAGE SENSE OUTPUT
WIRE FEEDER VOLTAGE SENSE — 122 — 67B
ROBOTIC VOLTAGE SENSE 311 — 67C
VOLTAGE SENSE SELECT (+) — 121 — 512
VOLTAGE SENSE SELECT (-) — 421 — 511
741, 800, 840

ARCLINK + — 154B — 3J16 — 54A
ARCLINK - — 153B — 1J16 — 53A
ELECTRODE SENSE — 67B — 5J16 — 67A
+40VDC — 52B — 6J16 — 52A
0 VDC — 51B — 4J16 — 51A
J16
Located behind front door panel.
L7
L6
L5
S1 ARCLINK RECEPTACLE
A — ARCLINK -
B — ARCLINK +
C — ELECTRODE SENSE
D — +40VDC
E — 0 VDC
Located under spring loaded cover See page 3 for details

N.D.
N.E.
jumper 9,10,11 for welder to operate

FEED HD BD

Schematic: G3823
Located on rear, right side of front door see page 3 for details

VOLTAGE SENSE SELECT (-) — 14J85 — 511
VOLTAGE SENSE SELECT (+) — 13J85 — 512
840 — 4J81 — +40VDC
800 — 3J81 — 0 VDC
741 — 2J81 — ARCLINK H
743 — 1J81 — ARCLINK L
154B — 2J82 — ARCLINK H
153B — 1J82 — ARCLINK L
51B — 3J82 — 0 VDC
52B — 4J82 — +40VDC

RED/GREEN STATUS LED
5W — 15J85 — (HIGH for RED)
5B — 16J85 — (HIGH for GREEN)
Blocking Diode for Motor
D6
886 — 5J83 — +40VDC
880 — 6J83 — +40VDC
Located on rear of control box (center)
DIP SWITCHES (see other sheet for use)

+15VDC TACH — 1J84 — 841
TACH COMMON — 4J84 — 844
TACH 1A DIFF. INPUT — 2J84 — 842
TACH 1B DIFF. INPUT — 3J84 — 843
TACH 2A DIFF. INPUT — 5J84 — 845
TACH 2B DIFF. INPUT — 6J84 — 846
SINGLE TACH INPUT — 7J84 — 847
MOTOR "+" — 1J83 — 539
MOTOR "-" — 2J83 — 541
SOLENOID +40VDC — 3J83 — 521
SOLENOID INPUT — 4J83 — 522
TRIGGER +15VDC — 1J85 — 851
TRIGGER INPUT — 2J85 — 852
DUAL PROC. INPUT — 3J85 — 853
4 STEP INPUT — 4J85 — 854
COLD INCH +15VDC — 5J85 — 855
COLD IN. FORWARD — 6J85 — 856
COLD IN. REVERSE — 7J85 — 857
GAS PURGE INPUT — 8J85 — 858
SHUTDOWN +15VDC — 9J85 — 859
SHUTDOWN 1 INPUT — 10J85 — 860
SHUTDOWN 2 INPUT — 11J85 — 861
INPUT B — 12J85 — 862

S6 WIREFEEDER INTERFACE RECEPTACLE
A — TACH +15VDC
B — TACH COMMON
C — TACH 1A DIFF SIGNAL
D — TACH 1B DIFF SIGNAL
E — TACH 2A DIFF SIGNAL
F — TACH 2B DIFF SIGNAL
G — SINGLE TACH INPUT
H — VOLTAGE SENSE
J — MOTOR "+"
K — MOTOR "-"
N — SOLENOID +40VDC
P — SOLENOID INPUT
T
GND-A
Located under spring loaded cover See page 3 for details

TACH signals are selected by software (standard or Diff type)

S7 I/O RECEPTACLE
1 — TRIGGER +15VDC
2 — TRIGGER INPUT
3 — DUAL PROC. INPUT
4 — 4 STEP INPUT
5 — COLD INCH +15VDC
6 — COLD IN. FORWARD
7 — COLD IN. REVERSE
8 — GAS PURGE INPUT
9 — SHUTDOWN +15VDC
10 — SHUTDOWN 1 INPUT
11 — SHUTDOWN 2 INPUT
12 — INPUT B
Located under spring loaded cover See page 3 for details

+15 VDC for Trigger Group
Trigger Input
Dual Procedure Input
4 Step Input
+15 VDC for Cold Inch Group
Cold Inch Forward
Cold Inch Reverse
Gas Purge Input
+15 for shutdown group
Shutdown1 input
Shutdown2 input
Reserved for future use
1 2 3 4 5 6 7 8 9 10 11 12
A B C D E F G H I

NOTES:
N.C. IF FEEDHEAD BOARD IS NOT PRESENT, INSERT P82 INTO J73.
N.D. COMMUNICATION INTERFACE MODULE.
N.E. ROBOTIC WIRE DRIVE INTERFACE MODULE.
N.F. K2202-4 MACHINES ONLY.

LEGEND
DASHED = "—— —— " STT MACHINE ONLY
PHANTOM= "—— · —— " OPTION

LEAD COLOR CODE: B-BLACK, G-GREEN, O-ORANGE, R-RED, U-BLUE, W-WHITE, Y-YELLOW
LABELS: COMMON, FRAME GROUND, EARTH GROUND
COMPONENT/VALUE UNITS: CAPACITOR: MFD/VOLTS; RESISTOR: OHMS/WATTS
CONNECTOR PIN NUMBERS: EX. 12 PIN CONNECTOR
VIEW OF CONNECTOR IN PC BOARD

Schematic numbers are given for reference only.

DESIGN INFORMATION	REFERENCE: G4050	EQUIPMENT TYPE: INVERTER WELDERS	PAGE 2 OF 3
DRAWN BY: F.Valenci		SUBJECT: 455M MACHINE SCHEMATIC	DOCUMENT NUMBER: G4421
ENGINEER: S.Poste	SCALE: NONE		DOCUMENT REVISION: F
APPROVED:	MATERIAL DISPOSITION: UF	APPROVAL DATE: 2/1/2007	PROJECT NUMBER: CRM22115-GC

EN-170 SOLID EDGE

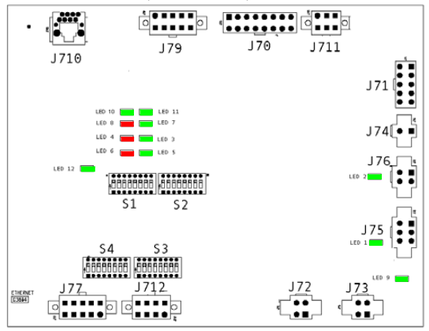
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
Return to Master TOC

SCHEMATIC - ENTIRE MACHINE - CODES 10957 - 11311 PG 3 OF 3 (G4421)

G4421 | ENGINEERING CONTROLLED MANUFACTURER: N0 | CHANGE DETAIL: CONTROL BOARD, CHANGED 234 TO 334

(OPTIONAL K2207)



Description of LED functions on the Power Wave 455M

For reference only

G3894 Ethernet Gateway PC Board		
LED #	COLOR	FUNCTION
1	Green	Indicates Isolated Module Section Supply is ON
2	Green	Indicates DeviceNet Supply is ON
3	Green	ArcLink Status Indicators (Main System ***Slave*** ArcLink Connection)
4	Red	Solid Green only when functional (See software for error codes)
5	Green	Reserved For Future Use
6	Red	
7	Green	DeviceNet Status Indicators (See software group for coding)
8	Red	
9	Green	Indicates Isolated ArcLink Section Supply is ON
10	Green	10Base-T Link Status ON indicates functional ethernet link has been established
11	Green	Receiver Polarity ON indicates proper ethernet signal polarity
12	Green	Indicates I/O+5V Supply is ON This is used by differential I/O pair 4 circuitry, J712 pins 1 and 2.

Ethernet Board DIP Switch :

Bank S1

Switch	Description	Comments
1	Object Instance LSB	Used for Arclink Configuration
2	Object Instance MSB	
3	Equipment Group 1 Select	
4	Equipment Group 2 Select	
5	Equipment Group 3 Select	
6	Equipment Group 4 Select	
7	Reserved for future use	
8	Reserved for future use	

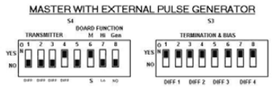
Table 15

Bank S2

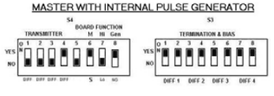
Switch	Description	Comments
1 - 2	Devicenet Baud Rate	Used for DeviceNet configuration
3 - 4	Devicenet Mac ID	

Configuring the DIP Switches on the Ethernet-Gateway Board

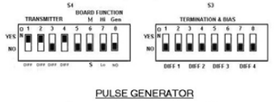
MASTER WITH EXTERNAL PULSE GENERATOR



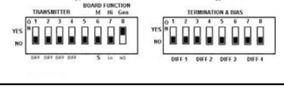
MASTER WITH INTERNAL PULSE GENERATOR



SLAVE



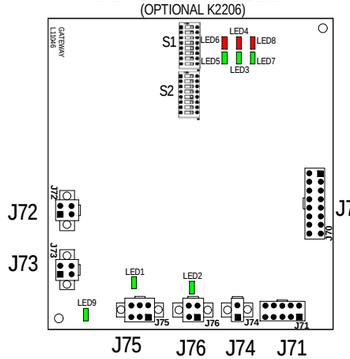
PULSE GENERATOR



EN-270

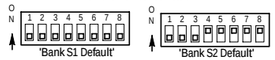
DEVICENET MODULE

(OPTIONAL K2206)



Devicenet Board DIP Switch	
Bank (S1)	
Switch	Description
1	Object Instance LSB (see Table 1)
2	Object Instance MSB (see Table 1)
3	Equipment Group 1 Select
4	Equipment Group 2 Select
5	Equipment Group 3 Select
6	Equipment Group 4 Select
7	Reserved for future use
8	Reserved for future use
Bank (S1)	
Switch	Description
1	DeviceNet Baud Rate
2	
3	
4	DeviceNet Mac ID Default ID=62
5	
6	
7	
8	

Configuring the DIP switches on the Devicenet Board

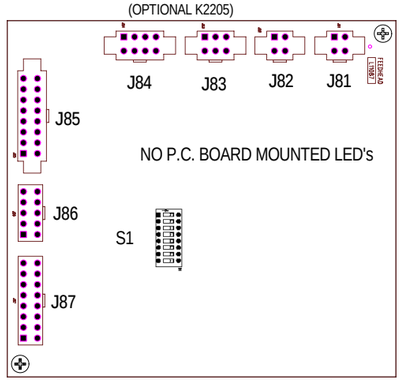


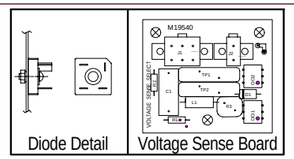
Description of LED functions on Power-Wave type systems

L11046 DeviceNet Gateway PC Board		
LED #	COLOR	FUNCTION
1	Green	Indicates Isolated Module Section Supply is ON
2	Green	Indicates DeviceNet Supply is ON
3	Green	ArcLink Status Indicators (Main System Slave ArcLink Connection) Solid
4	Red	Green only when functional (See software for error codes)
5	Green	Module Status Indicators (See software group)
6	Red	
7	Green	DeviceNet Status Indicators (See software group for coding)
8	Red	
9	Green	Indicates Isolated ArcLink Section Supply is ON

WIRE DRIVE MODULE

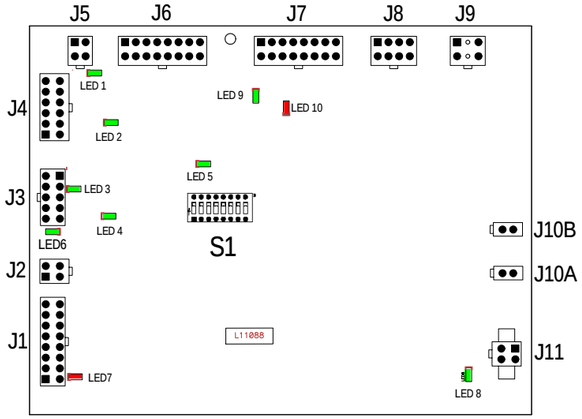
(OPTIONAL K2205)





Feed Head Board DIP Switch:

Switch		Description	Comments
1		Object Instance LSB	Used for Arclink Configuration
2		Object Instance MSB	
3		Equipment Group 1 Select	
4		Equipment Group 2 Select	
5		Equipment Group 3 Select	
6		Equipment Group 4 Select	
7	off	Electrode polarity positive (default)	Used for configuring electrode polarity
	on	Electrode polarity negative	
8	off	Low speed gear (default)	Used for configuring wirefeeder gear ratio



Control Board DIP Switch:

Switch		Description	Comments
1		Object Instance LSB	Used for Arclink configuration
2		Object Instance MSB	
3		Equipment Group 1 Select	
4		Equipment Group 2 Select	
5		Equipment Group 3 Select	
6		Equipment Group 4 Select	
7		Reserved for future use	
8	off	work sense lead not connected	Used for configuring work sense lead
	on	work sense lead connected	

Description of LED functions on the Power Wave 455M

For reference only

L11088 Digital Control PC Board		
LED #	COLOR	FUNCTION
1	Green	Indicates +15VDC from power supply board is present
2	Green	Indicates –15VDC from power supply board is present
3	Green	Indicates +5VDC for +5SPI from power supply board is present
4	Green	Indicates +15VDC for +15SPI from power supply board is present
5	Green	Indicates +5VDC for +5V from power supply board is present
6	Green	Indicates +5VDC for +5VRS232 from power supply board is present
7	Red	FAULT Signal (See software group for coding)
8	Green	Indicates +5VDC for +5CAN from power supply board is present
9	Green	ArcLink Status Indicators (Main System ***Master*** ArcLink Connection) Solid
10	Red	Green only when functional (See software for error codes)

POWER BOARDS

Description of LED functions on the Power Wave 455M

For reference only

G3632 Digital Power Supply Board		
LED #	COLOR	FUNCTION
1	Red	Indicates +5VDC SPI supply is present
2	Red	Indicates +5VDC control supply is present

L11078 +40 Volt DC Bus Board		
LED #	COLOR	FUNCTION
1	Red	Indicates +40 VDC supply is present

Troubleshooting the PowerWave

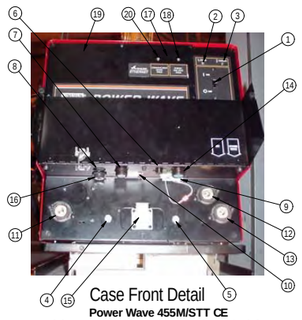
Using the Status LED

MEANING	
Steady Green	System OK. Power source communicating normally with wire feeder and its components.
Blinking Green	Occurs during a reset, and indicates the Power Wave is mapping (identifying) each component in the system. Normal for first 1-10 seconds after power is turned on, or if the system configuration is changed during operation
Alternating Green and Red	Non-recoverable system fault. If the PS Status light is flashing any combination of red and green, errors are present in the Power Wave. **Read the error code before the machine is turned off.** **Error Code interpretation** through the Status light is detailed in the Service Manual. Individual code digits are flashed in red with a long pause between digits. If more than one code is present, the codes will be separated by a green light. To clear the error, turn power source off, and back on to reset.

Error codes for the PowerWave

The following is a list of possible error codes that the Power Wave can output via the status light

Error Code #	Indication
11 CAN communication bus off.	Probably due to excessive number of communication errors.
12 User Interface time out error.	UI is no longer responding to the Power Source. The most likely cause is a fault/bad connection in the communication leads or control cable.
21 Unprogrammed Weld Mode.	Contact the Service Department for instructions on reloading the Welding Software.
22 Empty Weld Table.	Contact the Service Department for instructions on reloading the Welding Software.
23 Weld Table checksum error.	Contact the Service Department for instructions on reloading the Welding Software.
31 Primary overcurrent error.	Excessive Primary current present. May be related to a switch board or output rectifier failure.
32 Capacitor "A" under voltage (Left side facing machine) 33 Capacitor "B" under voltage (Right side facing machine)	Low voltage on the main capacitors. May be caused by improper input configuration, or an open/short circuit in the primary side of the machine.
34 Capacitor "A" over voltage (Left side facing machine) 35 Capacitor "B" over voltage (Right side facing machine)	Excess voltage on the main capacitors. May be caused by improper input configuration, or an open/short circuit in the primary side of the machine.
36 Thermal error	Indicates over temperature. Usually accompanied by Thermal LED. Check fan operation. Be sure process does not exceed duty cycle limit of the machine.
37 Softstart error	Capacitor precharge failed. Usually accompanied by codes 32-35.
41 Secondary overcurrent error	The secondary (weld) current limit has been exceeded. When this occurs the machine output will phase back to 100 amps, typically resulting in a condition refered to as "noodle welding"
42 Ground lead Current Shutdown (On K2202-4 machines only)	The K2202-4 has a special circuit installed that monitors current flowing on the input ground lead. When current is sensed, the machine will turn the welding output off. The machine will need to be turned off for several seconds and then back on to clear this error.
43 Capacitor delta error	The maximum voltage difference between the main capacitors has been exceeded. May be accompanied by errors 32-35.
49 Single phase error	Indicates machine is running on single phase input power. Usually caused by the loss of the middle leg (L2).
Other	Error codes that contain three or four digits are defined as fatal errors. These codes generally indicate internal errors on the PS Control Board. If cycling the input power on the machine does not clear the error, try reloading the operating system. If this fails, replace the control board.

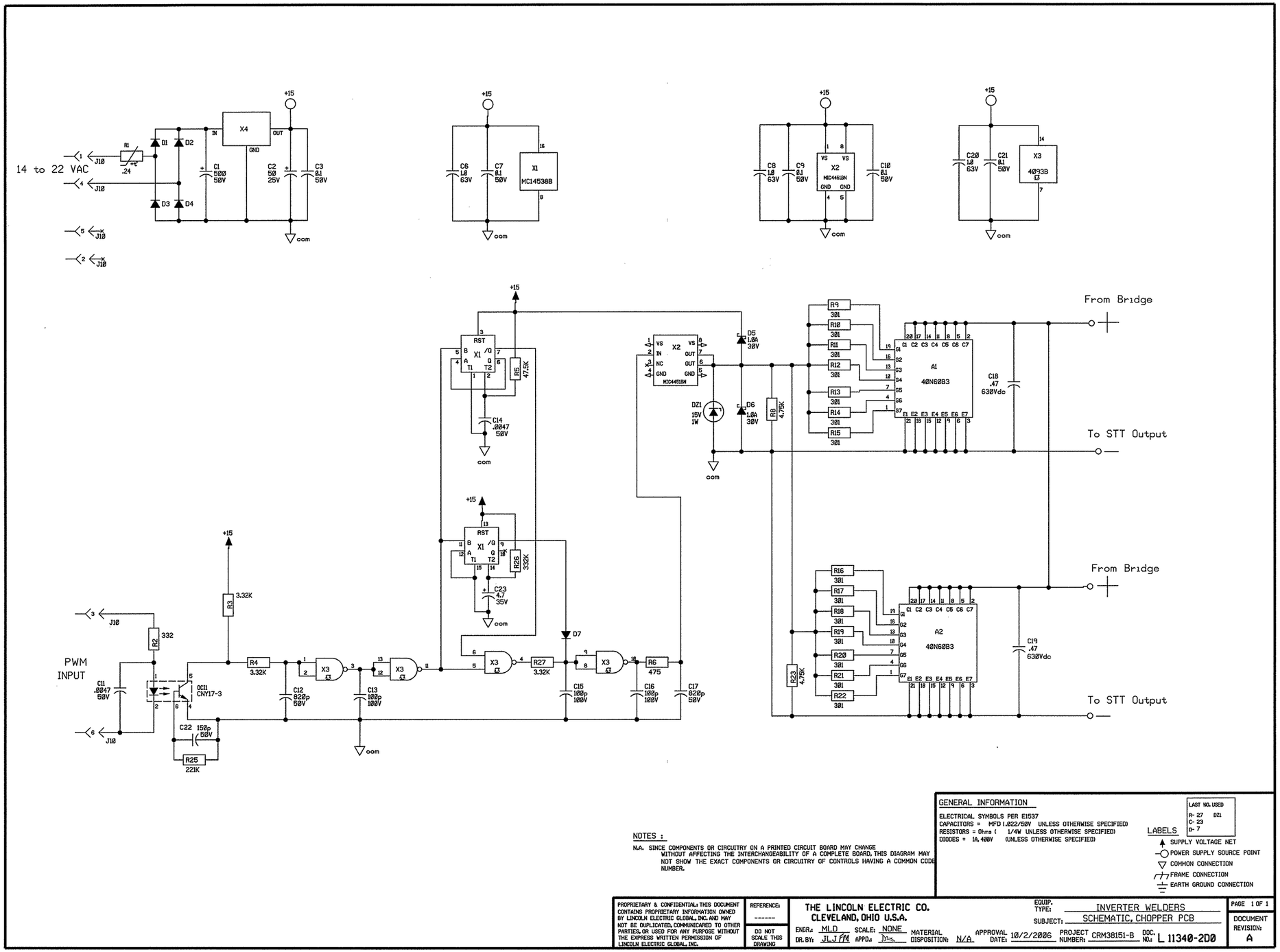


Power Wave 455M/STT CE
(shown with Wire Drive Interface Module & Ethernet communication Module)

DESIGN INFORMATION	REFERENCE:	EQUIPMENT TYPE:	INVERTER WELDERS		PAGE 3 OF 3	
DRAWN BY: F.Valencic	G4050	SUBJECT:	455M MACHINE SCHEMATIC		DOCUMENT NUMBER:	DOCUMENT REVISION:
ENGINEER: S.Pate	SCALE: NONE	MATERIAL DISPOSITION: UF	APPROVAL DATE: 2/1/2007	PROJECT NUMBER: CRM22115-GC	G4421	F
APPROVED: -						SOLIDWORKS

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - CHOPPER PC BD - (STT MODELS ONLY) (L11340-2)

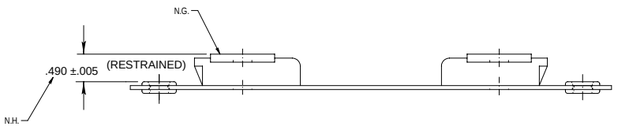


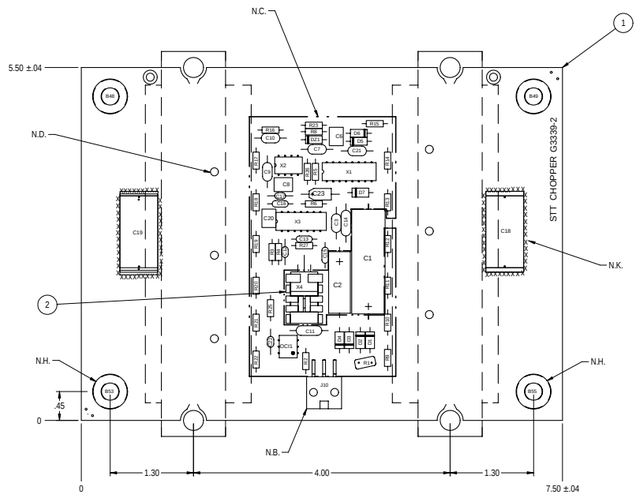
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

PC BOARD ASSEMBLY - CHOPPER PC BD - (STT MODELS ONLY) - (G3339-2)

G3339-2 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: REVISED MAKE SPECIFICATION

P.C. BOARD BLANK INFORMATION
BUY COMPLETE AS G3339-D (2 LAYER BOARD PER E3281)
(SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION)





NOTES :

N.A. CAUTION: THIS DEVICE IS SUBJECT TO DAMAGE BY STATIC ELECTRICITY. SEE E2454 BEFORE HANDLING.

N.B. DO NOT COAT WITH ENCAPSULATION MATERIAL.

N.C. THIS AREA TO BE COVERED ON BOTH SIDES OF BOARD WITH SEALANT PRIOR TO ENCAPSULATION.

N.D. INJECT SEALANT **ITEM 4** THROUGH THE PC BOARD HOLES (6 HOLES) TO SEAL MODULE LEADS. CAVITY BETWEEN BOARD AND MODULE TO BE COMPLETELY FILLED WITH **ITEM 4** SEALANT MATERIAL AS PER APPROPRIATE MANUFACTURING WORK INSTRUCTIONS. COVER ALL MODULE LEADS THAT PROTRUDE FROM THE NON-MODULE SIDE OF THE BOARD WITH **ITEM 4** SEALANT.

N.E. FEMALE EYELET TO BE AGAINST THE OPPOSITE COMPONENT SIDE AS SHOWN. EYELET MUST NOT SPIN AFTER CLINCHING.

N.F. SOLDER EYELET SO THAT SOLDER COVERS ENTIRE EYELET AND ALL AROUND EYELET ON OPPOSITE COMPONENT SIDE ONLY. NO ICICLES OR SOLDER BLOBS PERMITTED.

N.G. ELECTRONIC MODULES TO BE ASSEMBLED AND ENCAPSULATED PER E3875.

N.H. THIS DIMENSION APPLIES TO THESE TWO OF THE FOUR EYELETS AS SHOWN.

N.J. ELECTRONIC MODULES ON A COMMON P.C. BOARD ASSEMBLY TO HAVE VGE(TH) WITHIN 5 SORT CODES (0.5VSPAN) FOR THE SAME VCE(SAT) CODE AND MANUFACTURING CODE.

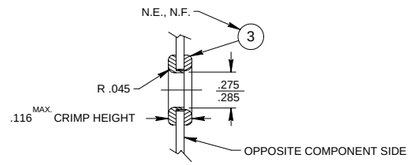
e.g. M21214-1 X XX XX .....

VENDOR CODE
VCE(SAT)
VGE(TH)

N.K. BEFORE ENCAPSULATION, APPLY A .19 WIDE BEAD OF **ITEM 4** SEALANT IN AREAS SHOWN TO ANCHOR CAPACITORS C18 AND C19 (2 PLACES).

	ITEM (USED WITH)*	QTY	PART NUMBER	DESCRIPTION
	1	1	G3339-D	PC BOARD BLANK
	2 (X4)*	1	S20590-1	HEAT SINK, TO-220
	3 (B48,B49,B53,B55)*	4	T9147-11	EYELET, FEMALE
	4	2 oz.	E2861	SEALANT
	REFERENCES	**QTY**	**PART NO.**	**DESCRIPTION**
N.A.,N.J.	A1, A2	2	M21214-1	ELECTRONIC MODULE,7 IGBT(T12704-85)
	B48, B49, B53, B55	4	T9147-15	EYELET, MALE
	C1	1	T11577-49	500/50
	C2	1	S13490-8	50/25
	C3, C7, C9, C10, C21	5	S16668-11	.1/50
	C6, C8, C20	3	S13490-173	CAPACITOR,MPF,1.0 uF,63VDC
	C11, C14	2	S16668-10	4700pF/50
	C12, C17	2	S16668-7	820pF/50
	C13, C15, C16	3	S16668-3	100pF/100
	C18, C19	2	S20500-2	.47/630
	C22	1	S16668-9	150pF/100
	C23	1	S13490-25	4.7/35
	D1, D2, D3, D4, D7	5	T12199-1	1N4004
	D5, D6	2	T12705-23	1N5818
	DZ1	1	T12702-29	1N4744A
N.B.	J10	1	S20351-6	HEADER
	OCI1	1	S15000-10	OPTO ISOLATOR
	R1	1	S18380-5	THERMISTOR,PTC,0.5-1.17 OHMS,0.5A
	R2	1	S19400-3320	332 1/4W
	R3, R4, R27	3	S19400-3321	3.32K 1/4W
	R5	1	S19400-4752	47.5K 1/4W
	R6	1	S19400-4750	475 1/4W
	R8, R23	2	S19400-4751	4.75K
	R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22	14	S19400-3010	301 1/4W
	R25	1	S19400-2213	221K 1/4W
	R26	1	S19400-3323	332K 1/4W
N.A.	X1	1	S15018-9	IC,CMOS,MULTIVIBRATOR,MONOSTABLE,DUAL,4538 (SS)
N.A.	X2	1	S15018-21	IC,DRIVER,9A LOW-SIDE MOSFET (SS)
N.A.	X3	1	S15018-15	IC,CMOS,GATE,NAND,2-INPUT,QUAD,SCHM (SS)
	X4	1	S15128-6	IC,SMD,VOLT REG,FIXED,3-TERMINAL,POS VOLT,1A,15V

CAPACITORS = MFD/VOLTS
RESISTORS = OHMS



EYELET DETAIL

MAKE PER E1911-ROHS
ENCAPSULATE WITH E1844 (1 COAT)
TEST PER E3647-CH

SCHEMATIC REFERENCE: L11340-2D0

MANUFACTURED AS:

G3339-2D0

IDENTIFICATION CODE

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253.

FOR PARTS ORDERS AND SUBSIDIARY ORDERS:
INCLUDE (1) S25191PRINT AND (1) T12837-1.

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UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E3556
ON 2 PLACE DECIMALS IS ± .02
ON 3 PLACE DECIMALS IS ± .005
ON ALL ANGLES IS ± 5.0° A DEGREE
MATERIAL TOLERANCE (T) TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

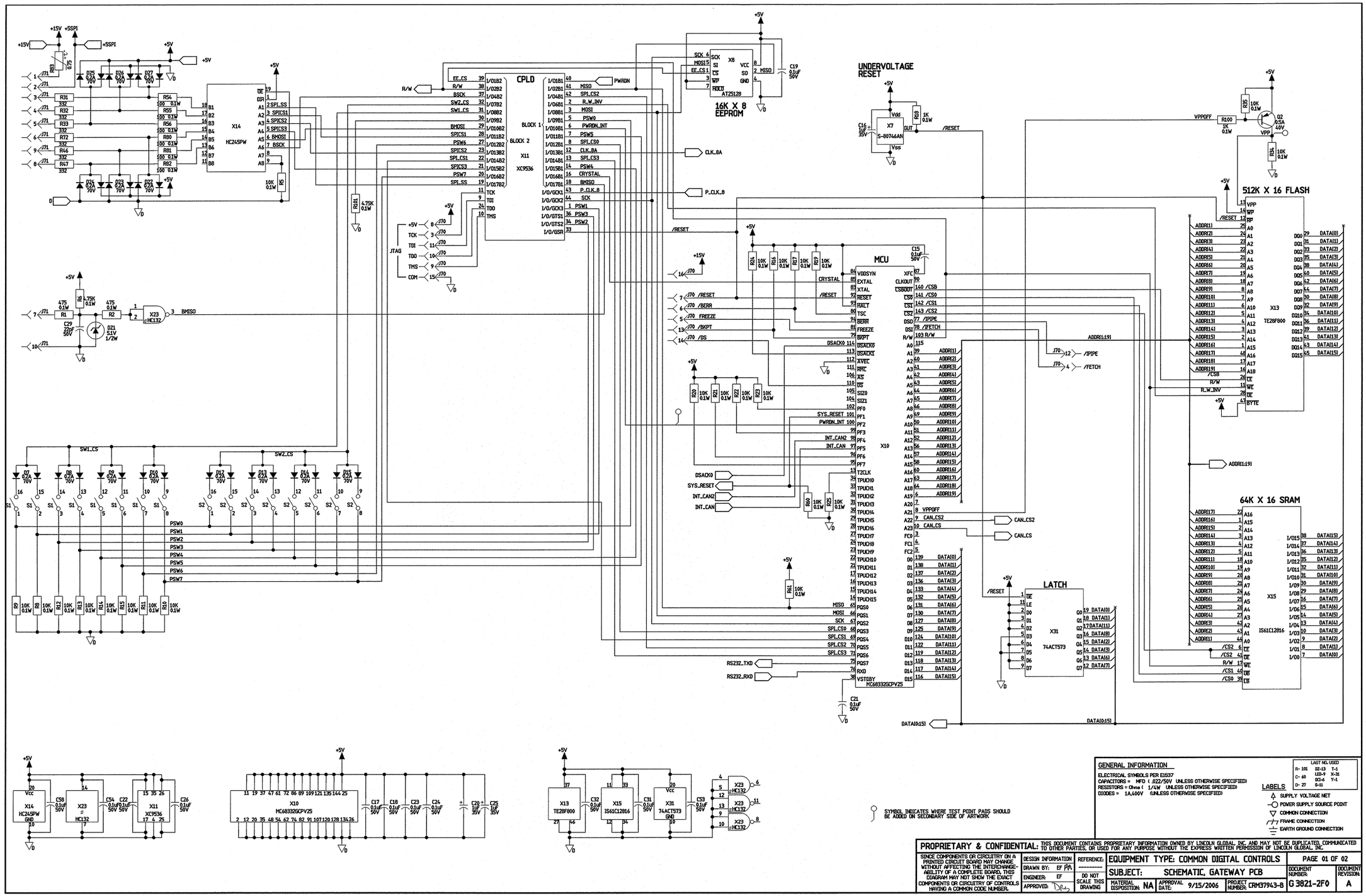
DESIGN INFORMATION	REFERENCE:	EQUIPMENT TYPE:	INVERTER WELDERS	PAGE 1 OF 1		
DRAWN BY: FEI	G3339-1	SUBJECT:	CHOPPER P.C. BOARD ASSEMBLY	DOCUMENT NUMBER: G3339-2	DOCUMENT REVISION: A	
ENGINEER:	SCALE: 1:1	MATERIAL DISPOSITION: UF	APPROVAL DATE: 10/2/2006	PROJECT NUMBER: CRM34409		
APPROVED: -						

SOLID EDGE
STRP

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

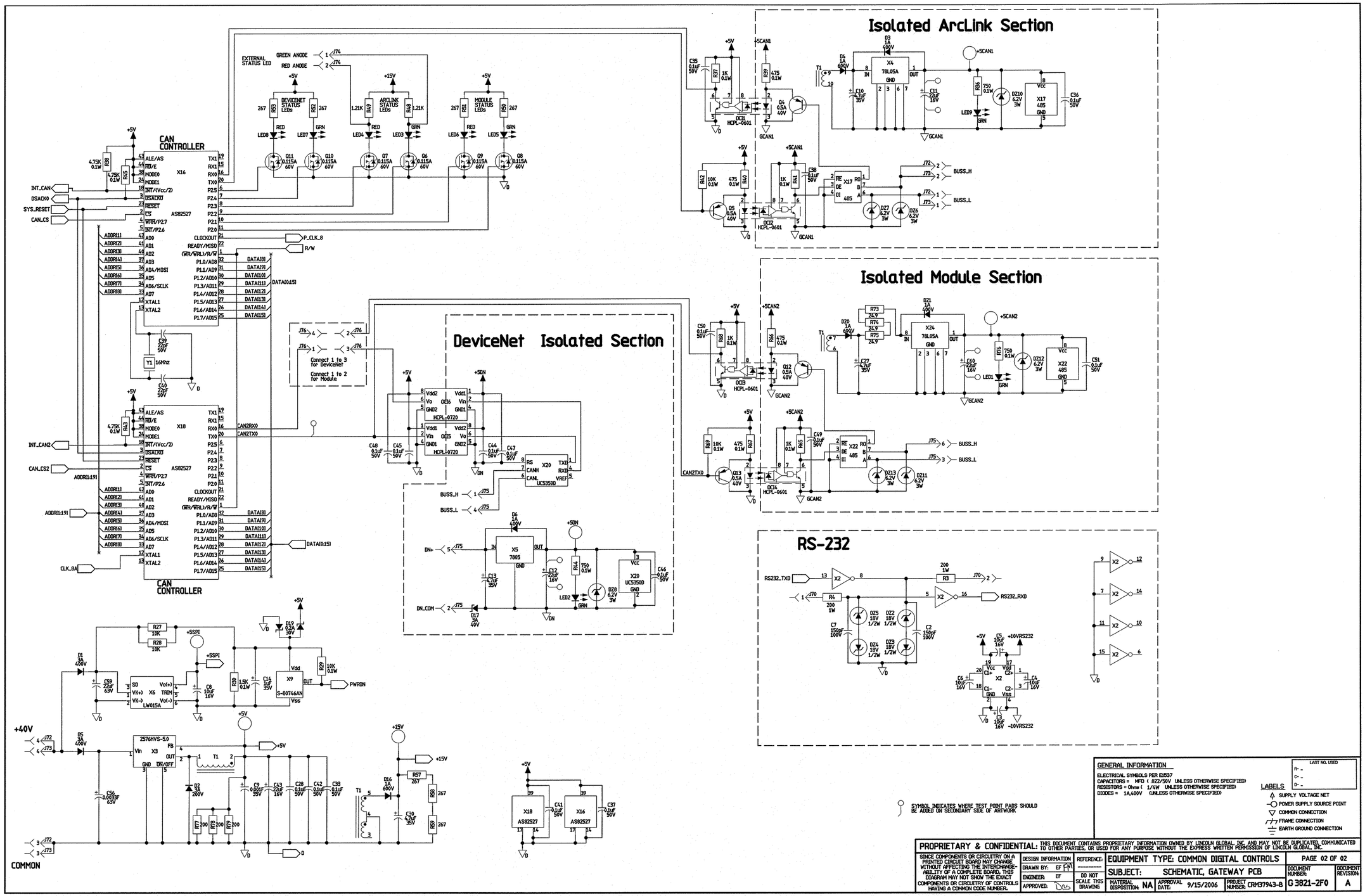
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SCHEMATIC - DEVICENET/GATEWAY PC BOARD (ROBOTIC MODEL ONLY) PG 1 OF 2 (G3821-2)



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - DEVICENET/GATEWAY PC BOARD (ROBOTIC MODEL ONLY) PG 2 OF 2 (G3821-2)



GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E1537
CAPACITORS = MFD (.022/50V UNLESS OTHERWISE SPECIFIED)
RESISTORS = Ohms (1/4W UNLESS OTHERWISE SPECIFIED)
DIODES = 1A,400V (UNLESS OTHERWISE SPECIFIED)

LAST NO. USED
R- -
C- -
D- -

LABELS
- SUPPLY VOLTAGE NET
- POWER SUPPLY SOURCE POINT
- COMMON CONNECTION
- FRAME CONNECTION
- EARTH GROUND CONNECTION

SYMBOL INDICATES WHERE TEST POINT PADS SHOULD BE ADDED ON SECONDARY SIDE OF ARTWORK

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SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGEABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.

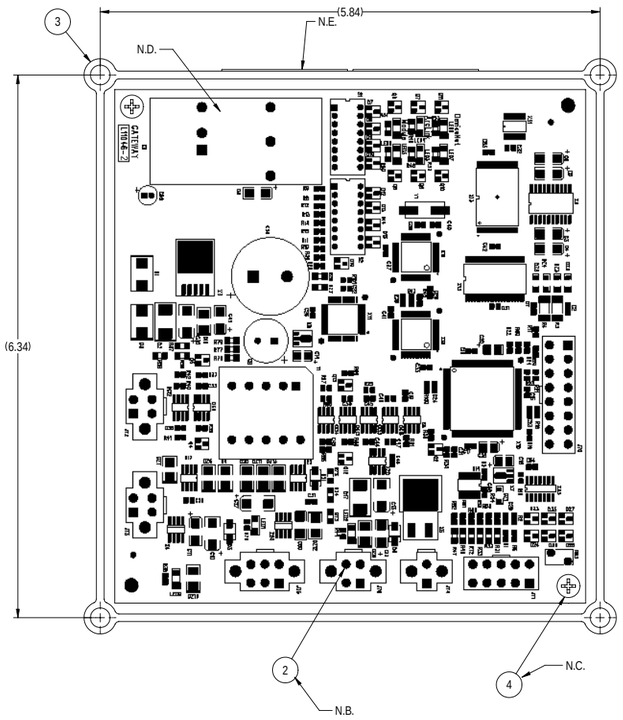
DESIGN INFORMATION	REFERENCE:	EQUIPMENT TYPE: COMMON DIGITAL CONTROLS	PAGE 02 OF 02
DRAWN BY: EF		SUBJECT: SCHEMATIC, GATEWAY PCB	
ENGINEER: EF	DO NOT SCALE THIS DRAWING		
APPROVED:		MATERIAL DISPOSITION: NA / APPROVAL DATE: 9/15/2006 / PROJECT NUMBER: CRM37943-B	DOCUMENT NUMBER: G3821-2F0 / DOCUMENT REVISION: A

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
Return to Master TOC

PC BOARD ASSEMBLY - DEVICENET/GATEWAY PC BOARD (ROBOTIC MODEL ONLY) (L11046-2)

L11046-2 | ENGINEERING CONTROLLED | CHANGE DETAIL: NEW
MANUFACTURER: Yes



NOTES:

N.A. **CAUTION:** THIS DEVICE IS SUBJECT TO DAMAGE BY STATIC ELECTRICITY. LINCOLN ELECTRIC TO SEE E2454 BEFORE HANDLING.

N.B. PLACE CONNECTOR KEYING PLUG, OVER HEADER PIN, IN LOCATION SHOWN. PLUG SHOULD BE INSERTED BELOW CONNECTOR TOP SURFACE.

N.C. SECURE PC BOARD ASSEMBLY IN PLACE WITH ITEM (4). (2 PLACES, 5.3 +/- .5 IN. LBS)

N.D. NO COMPONENTS ON BOTTOM SIDE OF PC BOARD.

N.E. PLACE BARCODED ASSEMBLY NUMBER IDENTIFICATION AND BARCODED SERIAL NUMBER IDENTIFICATION IN AREA SHOWN.

N.F. PROGRAM ITEM (60) WITH ITEM (7).

N.G. PROGRAM ITEM (61) WITH ITEM (8).

N.J. MUST BE COVERED BY ITEM 5 .

REVISION CONTROL

L11046-2F0

PART NO. IDENTIFICATION CODE

TEST PER E3856-G
POT WITH E2527

SCHEMATIC REFERENCE: G3821-2F0

BUY DETAIL	MAKE DETAIL
BUY PER E3867	MANUFACTURE PER E1911 BUY BLANK COMPLETE (4 BOARDS PER PANEL)

4 LAYER BOARD BLANK PANEL
SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION.

UNLESS OTHERWISE SPECIFIED:
RESISTANCE = OHMS

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253

	ITEM	PART NO.	QTY	PC BOARD REFERENCE DESIGNATORS	DESCRIPTION
	1	L11046-F	1		GATEWAY PC BOARD BLANK
	2	S24671	1		PLUG, KEYING PLUG
	3	M19436-5	1		POTTING TRAY
	4	S8025-80	2		SELF TAPPING SCREW
	5	E2527	195g	(6.87OZ)	EPOXY ENCAPSULATING RESIN
	6	E3539	AS REQ.		ELECTRICAL INSULATING COMPOUND
N.F.	7	S24824-3	1	X11	SOFTWARE CPLD
N.G.	8	S24825-1	1	X13	SOFTWARE, FLASH
	FOR ITEMS LISTED BELOW REFER TO ELECTRONIC COMPONENT DATABASE FOR COMPONENT SPECIFICATIONS				
	9	S25020-13SMT	2	C2,C7	CAPACITOR,SMD,CERAMIC,150pF,100V,5%,C
	10	S25024-8SMT	5	C3,C4,C5,C6,C8	CAPACITOR,SMD,TANTALUM,10MF,16V,10%,S
	11	S13490-179	1	C9	CAPACITOR,ALEL,1000,35V,20%
	12	S25024-5SMT	4	C10,C13,C27,C30	CAPACITOR,SMD,TANTALUM,4.7MF,35V,10%,
	13	S25024-6SMT	4	C11,C12,C43,C60	CAPACITOR,SMD,TANTALUM,22MF,16V,10%,S
	14	S25024-2SMT	4	C14,C16,C20,C25	CAPACITOR,SMD,TANTALUM,1.0MF,35V,10%,
	15	S25020-3SMT	30	C15,C17,C18,C19,C21,C22 C23,C24,C26,C28,C31,C32 C33,C35,C36,C37,C38,C41 C42,C44,C45,C46,C47,C48 C49,C50,C51,C53,C54,C58	CAPACITOR,SMD,CERAMIC,0.1MF,50V,10%,X
	16	S25020-15SMT	3	C29,C39,C40	CAPACITOR,SMD,CERAMIC,22PF,50V,5%,COG
	17	S13490-182	1	C56	CAP,ALEL,3300,63V,20%
	18	S13490-181	1	C59	CAP,ALEL,22,63V,20%
	19	S25040-10SMT	2	D1,D5	DIODE,SMD,3A,400V,D0-214AB
	20	S25040-9SMT	1	D2	DIODE,SMD,3A,200V,D0-214AB,ULTRA-FAST
	21	S25040-2SMT	3	D3,D6,D21	DIODE,SMD,1A,400V,DO-214BA/AC
	22	S25040-11SMT	3	D4,D16,D20	DIODE,SMD,1A,600V,S403A,ULTRA-FAST RE
	23	S25040-4SMT	8	D7,D8,D9,D10,D12,D13,D14 D15	DIODE,SMD,DUAL,0.200A,70V,UFR
	24	S25049-3SMT	1	D17	DIODE,SMD,3A,40V,SCHOTTKY,CASE 403-3
	25	S25049-4SMT	1	D19	DIODE,SMD,DUAL,200MA,30V,SCHOTTKY,SOT
	26	S25040-5SMT	6	D22,D23,D24,D25,D26,D27	DIODE,SMD,DUAL,0.200A,70V,UFR
	27	S25046-1SMT	1	DZ1	ZENER DIODE,SMD,0.5W,5.1V, 5%,SOD123
	28	S25046-3SMT	4	DZ2,DZ3,DZ4,DZ5	ZENER DIODE,SMD,0.5W,18V, 5%,SOD123
	29	S25044-9SMT	7	DZ6,DZ7,DZ8,DZ10,DZ11,DZ12 DZ13	ZENER DIODE,SMD,3W,6.2V,5%, SMB
	30	S18248-16	1	J70	CONNECTOR,MOLEX,MINI,PCB,16-PIN
	31	S18248-10	1	J71	CONNECTOR,MOLEX,MINI,PCB,10-PIN
	32	S24020-4	3	J72,J73,J76	CONNECTOR,MOLEX,MINI,PCB,4-PIN,TIN
	33	S24020-2	1	J74	CONNECTOR,MOLEX,MINI,PCB,2-PIN,TIN
	34	S24020-6	1	J75	CONNECTOR,MOLEX,MINI,PCB,6-PIN,TIN
	35	S25080-2SMT	6	LED1,LED2,LED3,LED5,LED7 LED9	LED,SMD,GREEN,CLEAR,S1206
	36	S25080-1SMT	3	LED4,LED6,LED8	LED,SMD,RED,CLEAR,S1206
N.A.	37	S15000-28SMT	4	OCI1,OCI2,OCI3,OCI4	OPTOCOUPLER,SMD,TTL-OUT,HI-SPD,HI-CMR
	38	S15000-32SMT	2	OCI5,OCI6	OPTOCOUPLER,SMD,CMOS,HIGH SPEED,HIGH
	39	S25050-2SMT	5	Q2,Q4,Q5,Q12,Q13	TRANSISTOR,SMS,PNP,SOT23,0.5A, 40V,MM
	40	S25051-4SMT	6	Q6,Q7,Q8,Q9,Q10,Q11	TRANSISTOR,SMD,NMF,SOT-23,0.115A,60V,
	41	S25000-4750SMT	6	R1,R2,R39,R40,R66,R67	RESISTOR,SMD,METAL FILM,1/10W,475OHMS
	42	S25003-2000SMT	2	R3,R4	RESISTOR,SMD,1W,200OHMS,1%
	43	S25000-1002SMT	25	R5,R8,R9,R10,R11,R12,R13 R14,R15,R16,R17,R19,R20 R21,R22,R23,R24,R25,R29 R34,R35,R42,R60,R61,R69	RESISTOR,SMD,METAL FILM,1/10W,10.0K,1
	44	S25000-4751SMT	5	R6,R38,R43,R45,R101	RESISTOR,SMD,METAL FILM,1/10W,4.75K,1
	45	S25000-1001SMT	6	R18,R37,R41,R65,R68,R100	RESISTOR,SMD,METAL FILM,1/10W,1.00K,1
	46	S25001-1002SMT	2	R27,R28	RESISTOR,SMD,10K,1/4W,1206,1%,TR
	47	S25000-1501SMT	1	R30	RESISTOR,SMD,METAL FILM,1/10W,1.50K,1
	48	S25001-3320SMT	6	R31,R32,R33,R46,R47,R72	RESISTOR,SMD,332OHMS,1/4W,1206,1%,TR
	49	S25000-7500SMT	3	R36,R44,R76	RESISTOR,SMD,METAL FILM,1/10W,750OHMS
	50	S25001-1211SMT	2	R48,R49	RESISTOR,SMD,1.21K,1/4W,1206,1%,TR
	51	S25001-2670SMT	7	R50,R51,R52,R53,R57,R58 R59	RESISTOR,SMD,267OHMS,1/4W,1206,1%,TR
	52	S25000-1000SMT	6	R54,R55,R56,R80,R81,R82	RESISTOR,SMD,METAL FILM,1/10W,100OHMS
	53	S25001-24R9SMT	3	R73,R74,R75	RESISTOR,SMD,24.9OHMS,1/4W,1206,1%,TR
	54	S25001-2000SMT	3	R77,R78,R79	RESISTOR,SMD,200OHMS,1/4W,1206,1%,TR
N.J.	55	S18380-5	1	R83	THERMISTOR,PTC,0.5-1.17 OHMS,0.5A
	56	S19869-8	2	S1,S2	SWITCH,DIP,SPST,8-CIRCUITS
	57	S20375-8	1	T1	TRANSFORMER,PCB,PWM,FLYBACK
N.A.	58	S20353-1SMT	1	X2	IC,SMD,CMOS,DRIVER,RECEIVER,EIA232,14
	59	S15128-25SMT	1	X3	IC,SMD,VOLTAGE REGULATOR,FIXED,POSITI
	60	S25068-6SMT	2	X4,X24	IC,SMD,VOLT REG,FIXED,3-T,(+),0.1A,5V
	61	S15128-5SMT	1	X5	IC,VOLT REG,SMD,FIXED,3-T,(+),1A,5V
	62	S24841-1	1	X6	IC,MODULE,CONVERTER,DC-DC,+5V/3A OUT
N.A.	63	S25068-7SMT	2	X7,X9	IC,SMD,CMOS,UNDERVOLT-SENSING,RESET,M
N.A.	64	S25069-2SMT	1	X8	IC,SMD,CMOS,EEPROM,SERIAL,SPI,64Kx8,S
N.A.	65	M15101-14SMT	1	X10	IC,SMD,CMOS,MCU,32-BIT,2K-RAM,TPU,25M
N.A.	66	S25070-3SMT	1	X11	CPLD,PROGRAMMABLE,XC9536,44-PIN,VQFP(
N.A.	67	S25069-3SMT	1	X13	IC,SMD,CMOS,EEPROM,FLASH,16-BIT,512K
N.A.	68	S17900-11SMT	1	X14	IC,SMD,CMOS,TRANCEIVER,BUS,3-STATE,OC
N.A.	69	M15104-15	1	X15	RAM,STATIC,16-BIT,64K,44-PIN,TSOP
N.A.	70	S20353-5SMT	2	X16,X18	IC,CMOS,CONTROLLER,COMMUNICATION,SERI
N.A.	71	S20353-4SMT	2	X17,X22	IC,CMOS,SMD,XCVR,EIA485(SS)
N.A.	72	S25068-4SMT	1	X20	IC,SMD,TRANSCEIVER,CAN,UC5350,S0IC-8
N.A.	73	S17900-24SMT	1	X23	IC,SMD,CMOS,GATE,NAND,2-INPUT,QUAD,SC
N.A.	74	S25065-2SMT	1	X31	IC,SMD,ACT,LATCH,OCTAL,3-STATE,TSSOP-
	75	S25082-1SMT	1	Y1	CRYSTAL,SMD,QUARTZ,16MHZ

UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056
ON 2 PLACE DECIMALS IS ± .02
ON 3 PLACE DECIMALS IS ± .002
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE ("I") TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

DESIGN INFORMATION
DRAWN BY: JIMJ
ENGINEER: ILD
APPROVED: -

REFERENCE: L11046-1
SCALE: 1:1

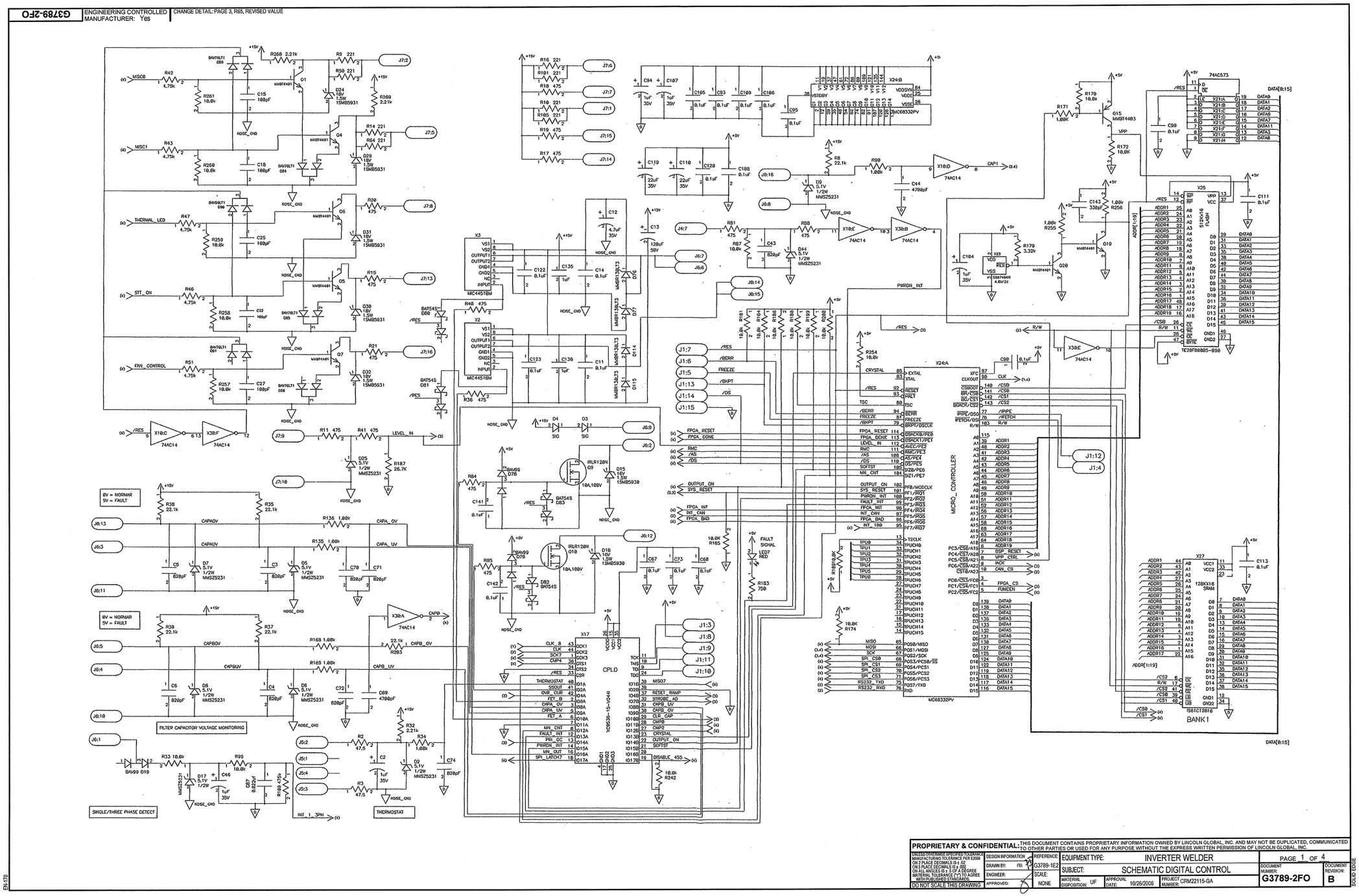
EQUIPMENT TYPE: COMMON DIGITAL CONTROLS
SUBJECT: GATEWAY PC BOARD ASSEMBLY
MATERIAL DISPOSITION: NA
APPROVAL DATE: 9-18-2006
PROJECT NUMBER: CRM37943-B

PAGE 1 OF 1
DOCUMENT NUMBER: L11046-2
DOCUMENT REVISION: A

SOLID EDGE
STRP

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

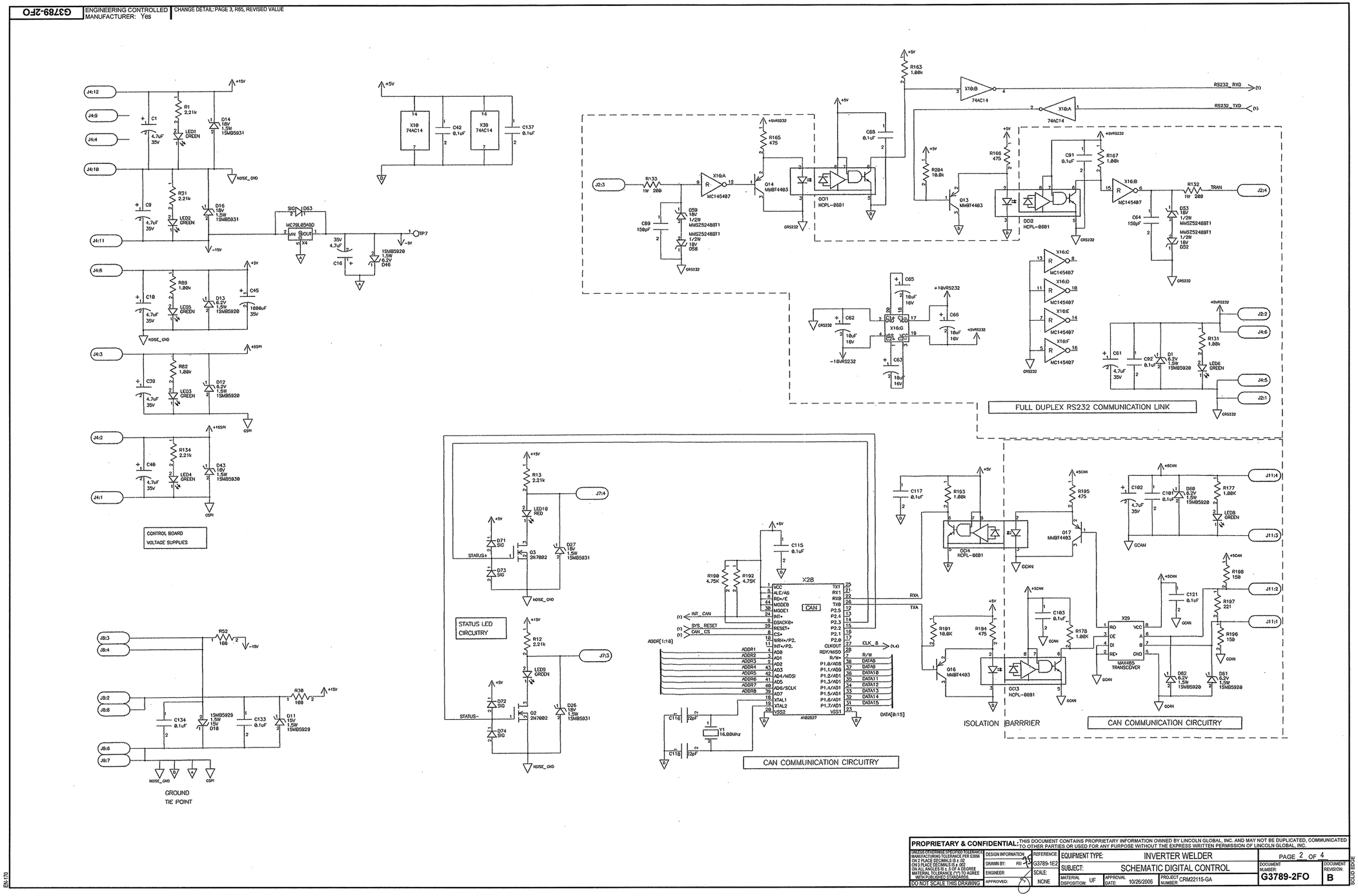
SCHEMATIC - CONTROL PC BOARD (ALL CODES) PG 1 OF 4 (G3789-2)



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

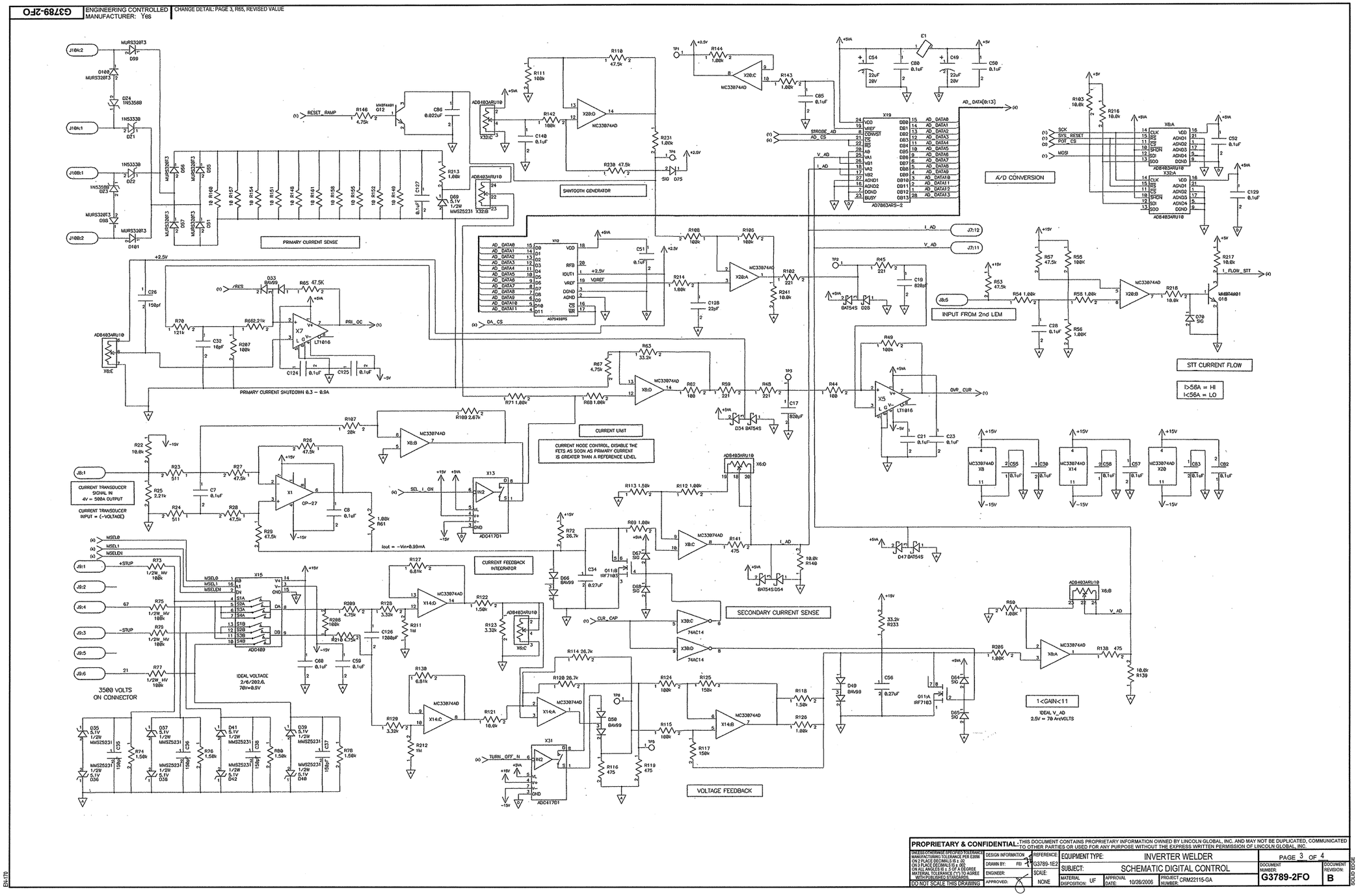
Return to Section TOC
Return to Master TOC

SCHEMATIC - CONTROL PC BOARD (ALL CODES) PG 2 OF 4 (G3789-2)



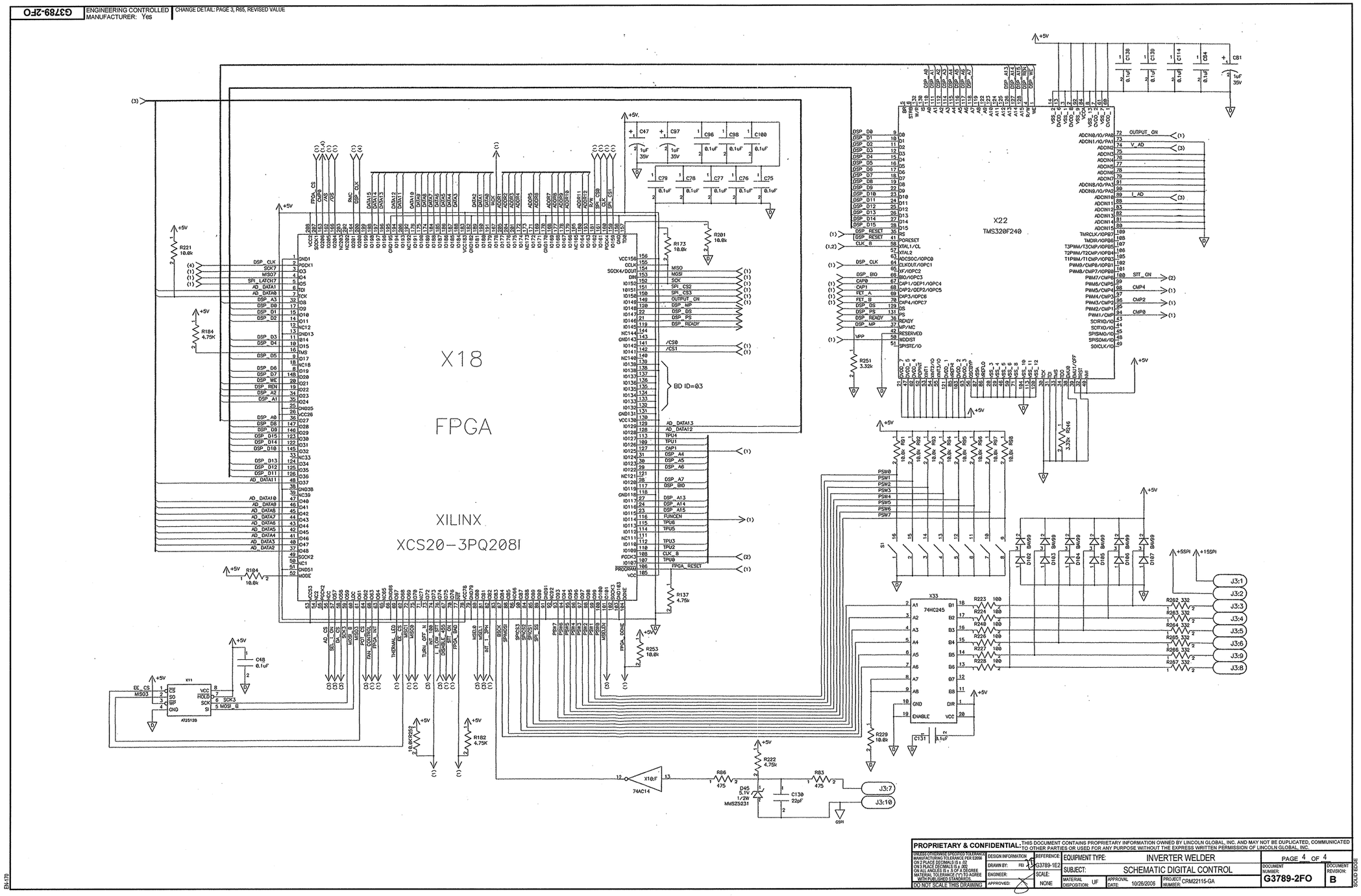
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - CONTROL PC BOARD (ALL CODES) PG 3 OF 4 (G3789-2)



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

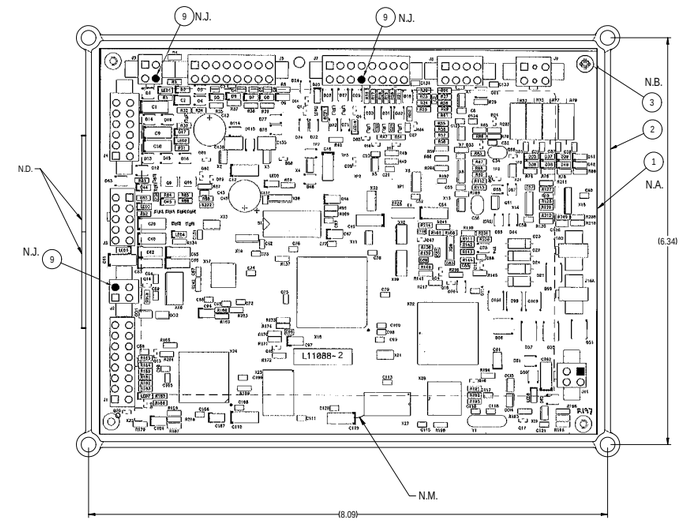
SCHEMATIC - CONTROL PC BOARD (ALL CODES) PG 4 OF 4 (G3789-2)



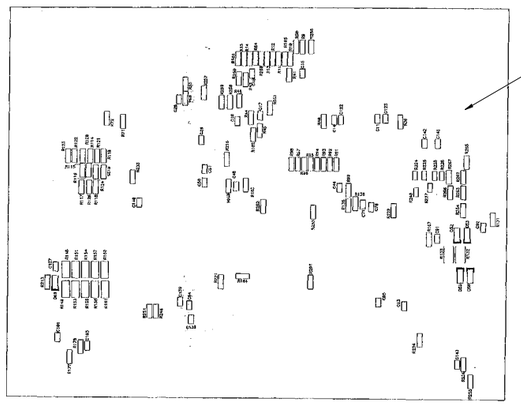
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

PC BOARD ASSEMBLY - CONTROL PC BOARD (ALL CODES) (L11088-2)

L11088-2 | ENGINEERING CONTROLLED MANUFACTURER: Yes | CHANGE DETAIL: ADDED MANUFACTURE SPECIFICATION



COMPONENT SIDE



OPPOSITE COMPONENT SIDE (BACKSIDE)

ITEM	PART NO.	REQ'D	DESCRIPTION	REFERENCE-DESIGNATOR
1	L11088-F	1	DIGITAL CONTROL P.C. BD. BLANK (REF. ONLY)	
2	M19436-1	1	POTTING TRAY	
3	S8025-80	2	SELF TAPPING SCREW	
4	E2527	6.01 oz.	EPOXY ENCAPSULATION RESIN	
5	E3539	0.01 oz.	ELECTRICAL INSULATING COMPOUND	
6	S26082-4	1	FLASH SOFTWARE	
7	S24804-3	1	CPLD FIRMWARE	
9	S24671	3	PLUG, KEYING PLUG	
	E3868-4	2	LAB,THT-53-423-3,BRADY,PLY	Barcode Labels
	S25020-15SMT	4	SCAP,22pF,0805,50V,COG,5%,TR,N	C118 C116 C128 C130
	S25024-10SMT	4	SCAP,22uF,TAN,7343,25V,,10%	C119 C110 C49 C54
	S25024-5SMT	9	SCAP,4.7uF,7343,35V,10%,TR,NP	C12 C102 C1 C9 C10 C39 C40 C16 C61
	S25020-23SMT	1	SCAP,1200pF,CER,1206,50V,,X7R,10%	C126
	S13490-183	1	SCAP,120MF,25V,20%,RADIAL,AE	C13
	S13490-173	2	CAP,1uF,RA,63V,10%,NP	C136 C135
	S25020-3SMT	69	SCAP,0.1uF,0805,50V,X7R,10%,TR	C7 C138 C134 C133 C125 C55 C96 C98 C100 C28 C82 C14 C11 C83 C103 C121 C101 C117 C115 C111 C113 C85 C90 C48 C93 C109 C120 C127 C106 C95 C105 C73 C88 C8 C114 C108 C99 C77 C76 C75 C84 C79 C67 C88 C80 C50 C78 C23 C21 C91 C51 C92 C58 C57 C52 C60 C59 C131 C123 C122 C124 C30 C129 C139 C140 C137 C141 C142 C42
	S25020-14SMT	1	SCAP,330pF,100V	C143
	S25020-12SMT	5	SCAP,100pF,0805,COG,100V,5%	C15, C18, C22, C25, C27
	S25020-18SMT	1	SCAP,10pF,CER,0805,100V,5%	C32
	S25020-4SMT	11	SCAP,820pF,0805,50V,COG,5%,TR,	C43 C4 C74 C3 C71 C19 C70 C5 C72 C6 C17
	S25020-10SMT	2	SCAP,4700pF,0805,50V,X7R,10%	C44 C69
	S13490-179	1	CAP,1000uF,ALU,35V,,20%,NP	C45
	S24833-1	2	CAP,0.27uF,MF,50V,,5mm,5%,TR,NP	C56 C34
	S25020-13SMT	7	SCAP,150pF,0805,100V,COG,5%,TR,	C64 C89 C26 C35 C36 C38 C37
	S25024-8SMT	4	SCAP,10uF,TAN,6032,TR,NP	C66 C62 C65 C63
	S25020-2SMT	2	SCAP,0.022uF,0805,50V,X7R,10%,	C86 C87
	S25024-2SMT	8	SCAP,1uF,TAN,3528,35V,TR,NP	C94 C97 C104 C107 C47 C81 C2 C46
	S25044-4SMT	2	SDIO,BS929,15V,1.5W,ZENER,TR,N	D10 D11
	S25044-10SMT	3	SDIO,BS930,16V,1.5W,ZENER,TR,N	D18 D15 D43
	S25046-1SMT	19	SDIO,MMSZ5231BT1,5.1V,NP	D25 D45 D44 D17 D9 D6 D2 D5 D7 D8 D35 D36 D38 D37 D42 D41 D40 D39 D69
	S25044-5SMT	9	SDIO,1SMB5931BT3,3W,18V,,5%	D27 D32 D26 D30 D31 D29 D24 D14 D16
	S25049-4SMT	8	SDIO,BAT54S,DUAL,30V,,200mA	D34 D54 D28 D47 D80 D81 D82 D83
	S25040-1SMT	8	SDIO,MURS320T3,3A,,200V,,ULTRAFAST	D51 D55 D56 D57 D98 D99 D100 D101
	S25046-3SMT	4	SDIO,MMSZ5248B,18V,,ZENER,TR,NP	D53 D52 D58 D59
	S25044-9SMT	7	SDIO,1SMB5920BT3,6.2V,,NP	D62 D61 D60 D13 D12 D1 D46
	S25040-5SMT	13	SDIO,BAV99LT1,SOT23,DUAL SWITC	D66 D50 D33 D49 D19 D78 D79 D102 D103 D104 D105 D106 D107
	S25040-2SMT	13	SDIO,1A,,400V,,DO-214BA,,GLS	D68 D67 D4 D3 D75 D63 D64 D65 D70 D72 D71 D73 D74
	S25049-2SMT	4	SDIO,MBRA130LT3,1A,,30V,,SCHOTKY	D76 D77 D114 D115
	S25040-6SMT	6	SDIO,,BAV70	D84 D85 D86 D89 D90 D91
	T12702-59	2	DIO,,1N5333B	DZ1 DZ2
	T12702-60	2	DIO,,1N5358B	DZ3 DZ4
	S25083-1SMT	1	SIND,FERRITEBEAD,TR,NP	E1
	S18248-16	1	CON,,16P,,MINI,NP	J1
	S24020-2	2	CON,,2P,,TIN,MINI,NP	J10A ,J10B
	S18248-10	1	CON,,10P,,MINI,NP	J3
	S24020-12	1	CON,,12P,,TIN,MINI,NP	J4
	S24020-4	3	CON,,4P,,TIN,MINI,NP	J5 J11 J2
	S24020-16	2	CON,,16P,,TIN,MINI,NP	J6 J7
	S24020-8	1	CON,,8P,,TIN,MINI,NP (or TH600-265)	J8
	S24020-6	1	CON,,6P,,TIN,MINI,NP	J9
	S25080-1SMT	2	SLED,RED,1206,TR,NP	LED7 LED10
	S25080-2SMT	8	SLED,GRN,1206,TR,NP	LED8 LED1 LED5 LED3 LED2 LED4 LED6 LED9
	S15000-28SMT	4	SICS,HCPL-0601,OPTOCOUPLER	OC1 OC2 OC3 OC4
	N/A	1	LEG ARTWORK	PCB
N.A.	S25051-7SMT	1	SICS,IRF7103,NP	Q11
N.A.	S25050-1SMT	9	STRA,MMBT4401LT,NPN,SOT-23	Q12 Q4 Q7 Q5 Q6 Q1 Q18 Q19 Q20
N.A.	S25050-2SMT	5	STRA,,2N4403,SOT23,TR,(S00475),N	Q17 Q16 Q15 Q13 Q14
N.A.	S25051-4SMT	2	STRA,,2N7002,TR,NP	Q3 Q2
N.A.	S25051-6SMT	2	STRA,,IRLR120N,,10A,,100V,,MOSFET,	Q9 Q10
	S25001-4753SMT	1	SRES,,475K,,1206,,1%,,1/8W,,TR,NP	R100
	S25000-2802SMT	1	SRES,,28K,,0805,,1%,,1/10W,,TR	R107
	S25001-2671SMT	1	SRES,,2.67K,,1206,,1%,,1/8W,,TR,,NP	R109
	S25001-1501SMT	7	SRES,,1.5K,,TKF,,1206,,1%,,1/4W,,TR	R113 R118 R122 R74 R76 R80 R78
	S25001-1503SMT	2	SRES,,150K,,1206,,1%,,1/8W,,TR	R117 R125
	S25001-3321SMT	6	SRES,,3.32K,,1206,,1%,,1/8W,,TR	R123 R128 R129 R179 R246 R251
	S25001-6811SMT	2	SRES,,6.81K,,1206,,1%,,1/4W,,TR	R127 R130
	S25003-2000SMT	2	SRES,,200,,2512,,5%,,1W,,TR,,NP	R132 R133
	S25006-10ROSMT	10	SRES,,10,	R151 R154 R157 R160 R148 R161 R158 R155 R152 R149
	S25001-1001SMT	33	SRES,,1K,,1206,,1%,,1/4W,,TR	R171 R178 R177 R193 R231 R167 R61 R34 R89 R82 R163 R135 R136 R169 R131 R112 R60 R56 R126 R71 R54 R69 R68 R143 R144 R58 R206 R213 R214 R90 R168 R255 R256
	S25001-1002SMT	47	SRES,,10K,,MF,,1206,,1%,,1/8W	R173 R191 R181 R164 R170 R172 R189 R186 R180 R91 R92 R93 R94 R95 R96 R97 R98 R22 R174 R201 R185 R104 R87 R33 R99 R260 R261 R139 R140 R121 R200 R199 R103 R221 R229 R204 R242 R241 R216 R217 R218 R252 R253 R254 R257 R258 R259
	S25001-7500SMT	1	SRES,,750,,1206,,1%,,1/4W,,TR	R183
	S25001-2672SMT	4	SRES,,26.7K,,THK,,1206,,1%,,1/8W,,10	R187 R114 R120 R72
	S25001-4751SMT	15	SRES,,4.75K,,1206,,1%,,1/8W,,TR	R190 R192 R182 R184 R137 R146 R209 R210 R222 R42 R43 R46 R47 R51 R67
	S25001-4750SMT	24	SRES,,475,,1206,,1%,,1/8W,,TR,,NP	R195 R194 R41 R11 R83 R86 R166 R165 R21 R15 R20 R88 R81 R17 R19 R18 R141 R138 R119 R116 R85 R84 R40 R36
	S25001-1500SMT	2	SRES,,150,,1206,,1%,,1/8W,,TR,,NP	R196 R198
	S25001-1004SMT	2	SRES,,1M,,1206,,1%,,1/8W,,TR	R212 R211

	PART NO.	REQ'D	DESCRIPTION	REFERENCE-DESIGNATOR
	S25000-1000SMT	6	SRES,100,,0805,,1%,,1/10W	R223, R224, R240, R226, R227, R228
	S25001-4752SMT	9	SRES,47.5K,,1206,,1%,,1/8W,,TR	R230 R27 R28 R26 R53 R29 R110 R57 R65
	S25001-5110SMT	2	SRES,,511,,MF,,1206,,1%,,1/8W,,TR	R24 R23
	S25001-2211SMT	10	SRES,,2.21K,,1206,,1%,,1/8W,,TR	R25 R13 R12 R32 R1 R31 R134 R66 R268 R269
	S25001-3320SMT	6	SRES,,332,,1206,,1%,,1/4W	R262 R263 R264 R265 R266 R267
	S25001-47RSSMT	2	SRES,,47.5,,TKF,,1206,,1%,,1/4W,,TR	R3 R2
	S25001-2212SMT	6	SRES,,22.1K,,1206,,1%,,1/8W,,TR,,NP	R27 R28 R35 R203 R8 R39
	S25001-1003SMT	10	SRES,,100K,,1206,,1%,,1/8W,,200PPM,	R55 R111 R49 R108 R115 R124 R142 R208 R207 R106
	S25001-2210SMT	13	SRES,,221,,1206,,1%,,1/8W,,TR	R59 R48 R102 R197 R45 R9 R10 R14 R16 R101 R50 R64 R105
	S25001-1000SMT	4	SRES,,100,,1206,,1%,,1/8W,,TR,,NP	R62 R44 R52 R30
	S25001-3322SMT	2	SRES,,33.2K,,1206,,1%,,1/8W,,TR,,NP	R63 R233
	S25001-1213SMT	1	SRES,,121K,,1206,,MF,,1%,,1/4W	R70
	S20620-1003	4	RES,,100K,,AX,,5%,,1/2W,,HI VOLT,,TR	R73 R79 R75 R77
N.C.	S18869-8	1	SWT,,78D08S,,DIP,,SPST,,8P,,NP	S1
N.A.	S15128-1SMT	1	SICS,,OP-27G,,OP-AMP,,SO8,,TR,,NP	X1
N.A.	S25065-3SMT	2	SICS,,74VHC14,,NP	X10 X30
N.A.	S25069-2SMT	1	SICS,,2512B,,SERIAL EEPR,,NP	X11
N.A.	M15105-9SMT	1	SICS,,7945 (old package)	X12
N.A.	S25067-3SMT	2	SICS,,ADG417,,SPST,,CMOS,,SWT,,SO8	X13 X31
N.A.	S25067-2SMT	1	SICS,,ADG409BR	X15
N.A.	S20353-1SMT	1	SICS,,MC145407,,RECEIVER/DRVR,,RS	X16
N.A.,N.G.	S25070-3SMT	1	ICS,,XC9536-15 VQ44	X17
N.A.	S25070-4SMT	1	SICS,,XCS20,,FPGA	X18
N.A.	S25066-2SMT	1	SICS,,AD7862,,DUAL,,12BIT,,250kSPS	X19
N.A.	S15018-21SMT	2	ICS,,MC1451BM	X2 X3
N.A.	S25065-2SMT	1	SICS,,74ACT573,,OCTAL,,TRANS.,,LAT	X21
N.A.	S25070-23SMT	1	SICS,,TMS320F240PQA,,NP	X22
N.A.	S25068-7SMT	1	SICS,,4.6V,,2%,,VOLT. DETECTOR,,SO	X23
N.A.	M15101-14SMT	1	SICS,,MC68332	X24
N.A.,N.F.	S25069-24SMT	1	SICS,,28F800B5-90,,FLASH RO,,90n	X25
N.A.	S25069-7SMT	1	SICS,,128Kx16,,20nS,,TSOP	X27
N.A.	S20353-5	1	SICS,,AN82527	X28
N.A.	S20353-4SMT	1	SICS,,MAX485ESA,,NP	X29
N.A.	S17900-11SMT	1	74HC245, NEW PACKAGE	X33
N.A.	S25068-8SMT	1	SICS,,MC79L05ABD	X4
N.A.	S15128-21SMT	2	SICS,,LT1016,,COMPARATOR	X5 X7
N.A.	S25057-3SMT	2	SICS,,AD8403ARU10	X6 X32
N.A.	S15128-18SMT	3	SICS,,MC33074,,QUAD,,OPAMP,,SO14,,T	X8 X14 X20
N.A.	S25082-1SMT	1	SXTL,,16MHZ,,HC40,,20PF,,NP	V1

NOTES:
N.A. CAUTION: THIS DEVICE IS SUBJECT TO DAMAGE BY STATIC ELECTRICITY. LINCOLN ELECTRIC TO SEE E2454 BEFORE HANDLING.
N.B. SECURE P.C. BOARD ASSEMBLY IN PLACE WITH (*ITEM 3*) (2 PLACES, 4.8-5.8 IN. LBS.)
N.C. TOP OF THESE COMPONENTS MUST BE FREE OF POTTING MATERIAL.
N.D. PLACE BARCODED ASSEMBLY NUMBER IDENTIFICATION AND BARCODED SERIAL NUMBER IDENTIFICATION IN AREA SHOWN.
N.E. THERE ARE COMPONENTS ON BOTTOM SIDE OF P.C. BOARD.
N.F. PROGRAM *X25* WITH *ITEM 6*.
N.G. PROGRAM *X17* WITH *ITEM 7*.

N.J. PLACE CONNECTOR KEYING PLUG (*ITEM 9*) OVER HEADER PIN, IN LOCATION SHOWN. PLUG SHOULD BE INSERTED BELOW CONNECTOR TOP SURFACE.
N.K. ALL CONNECTORS MUST BE GREASED WITH (*ITEM 5*) PRIOR TO ENCAPSULATION.
N.L. ENCAPSULATION PER E1911-E TO A MINIMUM DEPTH, SUCH THAT ALL COMPONENT LEADS ARE COVERED.
N.M. SOLDER A #30 INSULATED COPPER WIRE FROM PIN 23 OF X27 TO POSITIVE TERMINAL ON C119 AS SHOWN.

CAPACITORS = MFD/VOLTS
INDUCTANCE = HENRIES
RESISTANCE = OHMS

MANUFACTURE PER E1911-ROHS
SCHEMATIC REF. G3789-2F0

BUY PER E3867
TEST PER E3856-C

BUY AS L11088-2F0
PART NO. — IDENTIFICATION CODE

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253.

UNLESS OTHERWISE SPECIFIED TOLERANCE PER E3356 ON 2 PLACE DECIMALS IS ± .02 ON 3 PLACE DECIMALS IS ± .002 ON ALL ANGLES IS ± 1 OF A DEGREE MATERIAL TOLERANCE ("L") TO AGREE WITH PUBLISHED STANDARDS. DO NOT SCALE THIS DRAWING

DESIGN INFORMATION | REFERENCE: L11088-1
DRAWN BY: FEI
ENGINEER:
APPROVED:
SCALE: NONE

EQUIPMENT TYPE: INVERTER WELDERS
SUBJECT: CONTROL P.C. BOARD AS'BLY
MATERIAL DISPOSITION: UF | APPROVAL DATE: | PROJECT NUMBER: CRM34409

PAGE 1 OF 1
DOCUMENT NUMBER: L11088-2
DOCUMENT REVISION: F.01

SOLID EDGE
STRP

Return to Section TOC
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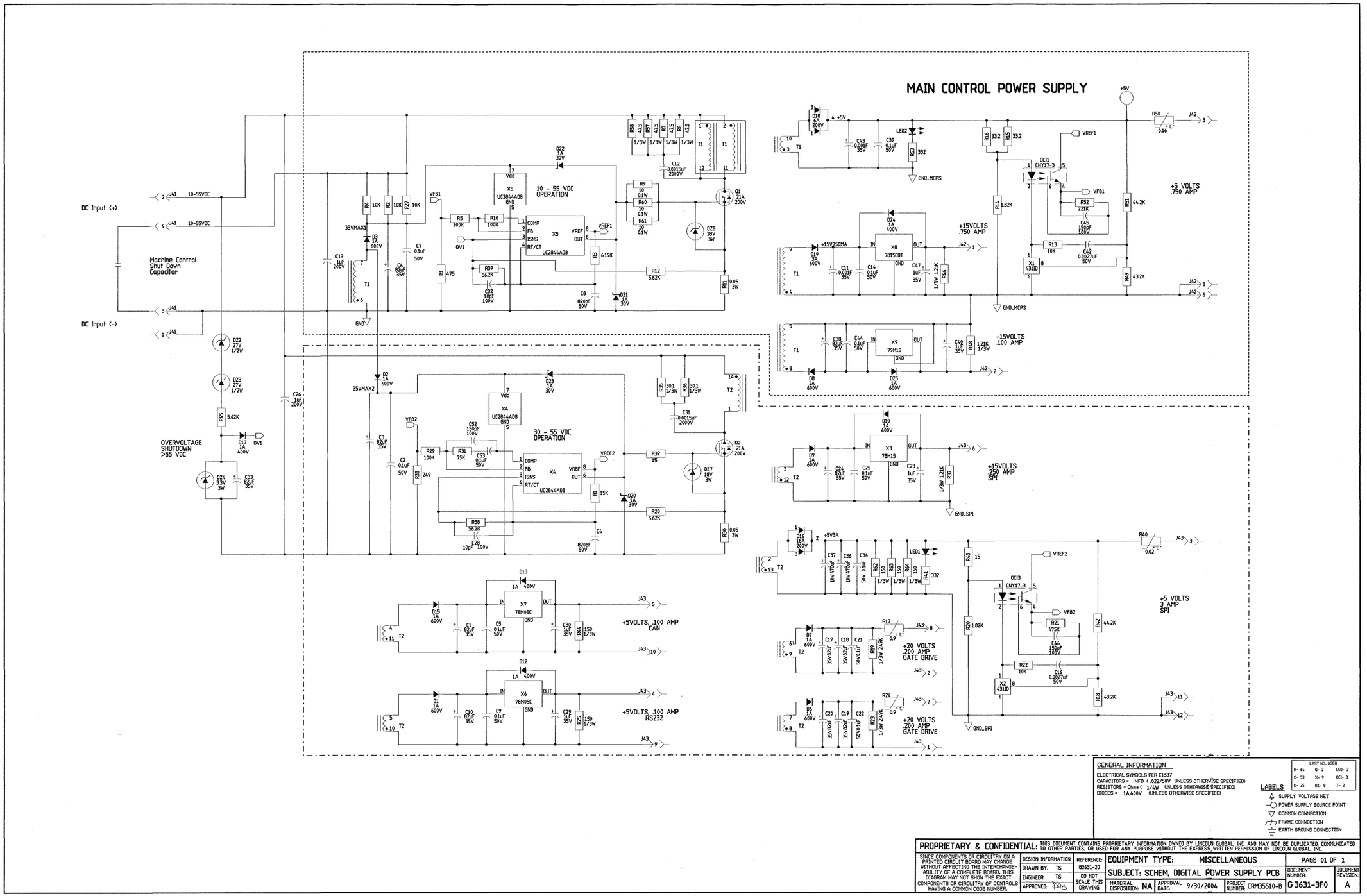
SCHEMATIC - DIGITAL POWER SUPPLY PC BOARD (ALL CODES) (G3631-3)



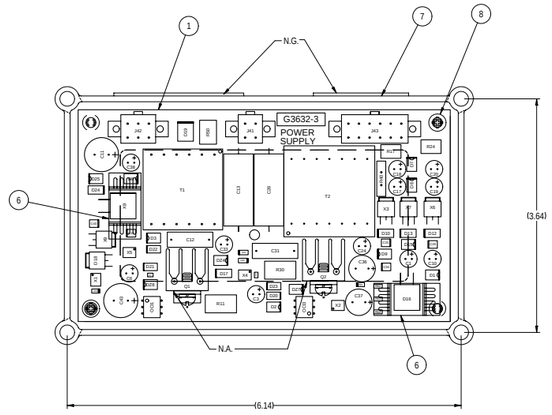
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

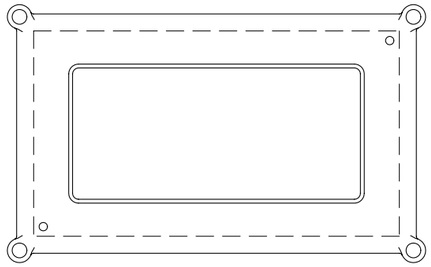
Return to Section TOC
Return to Master TOC

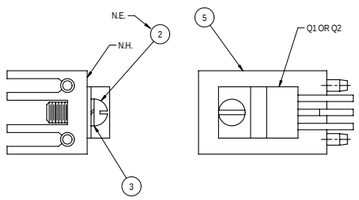
Return to Section TOC
Return to Master TOC

PC BOARD ASSEMBLY - DIGITAL POWER SUPPLY PC BOARD (ALL CODES) (G3632-3)

G3632-3 | ENGINEERING CONTROLLED MANUFACTURER: Yes | CHANGE DETAIL: REVISED IDENTIFICATION CODE, BLANK PART NIMBER, SCHEMATIC REFERFENCE AND UPDATED GRAPHICS







HEATSINK MOUNTING DETAIL

NOTES:

N.A. SEE HEAT SINK MOUNTING DETAILS.

N.B. ALL CONNECTORS MUST BE GREASED WITH ITEM 10 PRIOR TO ENCAPSULATION.

N.C. ATTACH ITEM 1 TO ITEM 7 (2 PLACES) WITH ITEM 8 (TORQUE = 5.3 +/- .05 IN-LB). ITEM 1 SHOULD BE ALLIGNED SO THAT THE DISTANCE BETWEEN ITEM 1's CONNECTORS AND ITEM 7 IS AS LARGE AS POSSIBLE.

N.D. ENCAPSULATION PER E1911-E TO A MINIMUM DEPTH SO ALL OF THE COMPONENTS LEADS ARE COVERED.

N.E . TIGHTEN TO 6-8 in. lbs. WITHOUT APPLYING ANY PRESSURE TO PLASTIC CASE OF Q1 AND Q2.

N.G. PLACE BARCODED ASSEMBLY NUMBER IDENTIFICATION AND BARCODED SERIAL NUMBER IDENTIFICATION IN AREA SHOWN.

N.H. PLACE A HEAVY FILM OF ITEM 4 ON HEAT SINK SURFACE. DO NOT GET ON THREADS.

	ITEM (USED WITH)	QTY	PART NUMBER	DESCRIPTION
	1	1	G3632-F	PC BOARD BLANK
N.A.	2 (Q1, Q2)	2	CF000003	6-32 X .375 ROUND HEAD MACHINE SCREW
N.A.	3 (Q1, Q2)	2	E106A-13	# 6 LOCK WASHER
	4 (Q1, Q2)	AS REQ	E1868	THERMO JOINT COMPOUND
N.A.	5 (Q1, Q2)	2	S18104-5	HEAT SINK,ALUMINUM,EXTRUDED,FOR 1 TO-220,1.0
	6 (D16, X8)	2	S25128-1SMT	SMD HEAT SINK FOR D2PAK TO-263
	7	1	M19436-3	POTTING TRAY
	8	2	S8025-80	SELF TAPPING SCREW
	9	115g	E2527	EPOXY ENCAPSULTION RESIN
	10	AS REQ	E2861	ELECTRICAL INSULATION COMPOUND

REFER TO ELECTRONIC COMPONENT DATABASE FOR SPECIFICATIONS ON ITEMS LISTED BELOW

REFERENCES	QTY	PART NUMBER	DESCRIPTION
C1, C3, C6, C10, C17, C18, C19, C20, C24, C33, C38	11	S13490-197	CAPACITOR,ALEL,82,35V,20%,LOW-ESR
C2, C5, C7, C9, C14, C21, C22, C25, C34, C39, C44, C53	12	S25020-3SMT	CAPACITOR,SMD,CERAMIC,0.1MF,50V,10%,X7R,S0805
C4, C8	2	S25020-4SMT	CAPACITOR,SMD,CERAMIC,820pF,50V,5%,COG,S0805
C11, C43	2	S13490-198	CAPACITOR,ALEL,1000,35V,20%,LOW-ESR
C12, C31	2	S20500-5	CAPACITOR,PPMF,.0015,2000V,BOX
C13, C26	2	T11577-62	CAPACITOR,PEMF,1.0,200V,10%
C16, C42	2	S25020-5SMT	CAPACITOR,SMD,CERAMIC,2700pF,50V,5%,X7R,S0805
C23, C29, C30, C40, C47	5	S25024-2SMT	CAPACITOR,SMD,TANTALUM,1.0MF,35V,10%,S3528
C28, C32	2	S25020-18SMT	CAPACITOR,SMD,CERAMIC,10nF,100V,5%,COG,S0805
C36, C37	2	S13490-202	CAPACITOR,ALEL,470MF,10V,20%
C45, C46, C52	3	S25020-13SMT	CAPACITOR,SMD,CERAMIC,150pF,100V,5%,COG,S0805
D1, D2, D3, D6, D7, D8, D9, D15, D25	9	S25040-11SMT	DIODE,SMD,1A,600V,S403A,ULTRA-FAST RECOVERY
D10, D12, D13, D17, D24	5	S25040-2SMT	DIODE,SMD,1A,400V,DO-214BA/AC
D16	1	S25040-13SMT	DIODE,SMD,DUAL,16A,200V,D2PAK,CC,ULTRA-FAST RECOVERY
D18	1	S25040-3SMT	DIODE,SMD,DUAL,6A,200V,DPAK,CC,ULTRA-FAST RECOVERY
D19	1	S25040-8SMT	DIODE,SMD,3A,600V,D0-214AB,ULTRA-FAST RECOVERY
D20, D21, D22, D23	4	S25049-2SMT	DIODE,SMD,SCHOTTKY,1A,30V,SMA
D22, DZ3	2	S25046-5SMT	ZENER DIODE,SMD,0.5W,.27V,5%,SOD-123
DZ4	1	S25044-12SMT	ZENER DIODE,SMD,3W,3.3V,5%, SMB
DZ7, DZ8	2	S25044-5SMT	ZENER DIODE,SMD,3W,18V,5%, SMB
N.B. J41	1	S24020-4	CONNECTOR,MOLEX,MINI,PCB,4-PIN,TIN
N.B. J42	1	S24020-6	CONNECTOR,MOLEX,MINI,PCB,6-PIN,TIN
N.B. J43	1	S24020-12	CONNECTOR,MOLEX,MINI,PCB,12-PIN,TIN
LED1, LED2	2	S25080-1SMT	LED,SMD,RED,CLEAR,S1206
OCI1, OCI3	2	S15000-10	OPTOCOUPLER,PHOTO-Q,70V,CNY17-3
N.A. Q1, Q2	2	T12704-93	TRANSISTOR,NMF,T220,21A,200V,BUZ30A
R1	1	S25001-1502SMT	RESISTOR,SMD,15K,1/4W,1206,1%,TR
R2, R4, R13, R22, R27	5	S25001-1002SMT	RESISTOR,SMD,10K,1/4W,1206,1%,TR
R3	1	S25001-6191SMT	RESISTOR,SMD,6.19K,1/4W,1206,1%,TR
R5, R10, R29	3	S25001-1003SMT	RESISTOR,SMD,100K,1/4W,1206,1%,TR
R6, R7, R57, R58	4	S25002-47R5SMT	RESISTOR,SMD,47.5OHMS,1/3W,MF,1%,S1210
R8	1	S25001-4750SMT	RESISTOR,SMD,475OHMS,1/4W,1206,1%,TR
R9, R60, R61	3	S25000-10R0SMT	RESISTOR,SMD,METAL FILM,1/10W,10.0OHMS,1%,S0805
R11, R30	2	S25005-1SMT	RESISTOR,SMD,METAL STRIP,3W,0.05OHMS,1%
R12, R28, R45	3	S25001-5621SMT	RESISTOR,SMD,5.62K,1/4W,1206,1%,TR
R14, R20	2	S25001-1821SMT	RESISTOR,SMD,1.82K,1/4W,1206,1%,TR
R15, R16	2	S25001-33R2SMT	RESISTOR,SMD,33.2OHMS,1/4W,1206,1%,TR
R17, R24	2	S25084-2SMT	THERMISTOR,SMD,PTC,0.35./1.4OHMS,2.0A
R18, R49	2	S25001-4322SMT	RESISTOR,SMD,43.2K,1/4W,1206,1%,TR
R19, R23	2	S25002-2491SMT	RESISTOR,SMD,2.49K,1/3W,MF,1%,S1210
R21	1	S25001-4753SMT	RESISTOR,SMD,475K,1/4W,1206,1%,TR
R25, R44, R62, R63, R64	5	S25002-1500SMT	RESISTOR,SMD,150OHMS,1/3W,MF,1%,S1210
R31	1	S25001-7502SMT	RESISTOR,SMD,75.0K,1/4W,1206,1%,TR
R32, R43	2	S25001-15R0SMT	RESISTOR,SMD,15.0OHMS,1/4W,1206,1%,TR
R33	1	S25001-2490SMT	RESISTOR,SMD,249OHMS,1/4W,1206,1%,TR
R35, R36	2	S25002-30R1SMT	RESISTOR,SMD,30.1OHMS,1/3W,MF,1%,S1210
R37, R46, R48	3	S25002-1211SMT	RESISTOR,SMD,1.21K,1/3W,MF,1%,S1210
R38, R39	2	S25001-5622SMT	RESISTOR,SMD,56.2K,1/4W,1206,1%,TR
R40	1	S18380-15	THERMISTOR,PTC,0.01/0.03OHMS,4.0A
R41, R53	2	S25001-3320SMT	RESISTOR,SMD,332OHMS,1/4W,1206,1%,TR
R42, R51	2	S25001-4422SMT	RESISTOR,SMD,44.2K,1/4W,1206,1%,TR
R50	1	S25084-1SMT	THERMISTOR,SMD,PTC,0.06/.25OHMS,1.5A
R52	1	S25001-2213SMT	RESISTOR,SMD,221K,1/4W,1206,1%,TR
T1	1	S20375-13	TRANSFORMER,PCB,PWM,FLYBACK
T2	1	S20375-10	TRANSFORMER,PCB,PWM,FLYBACK
X1, X2	2	S15128-10SMT	IC,SMD,VOLTAGE REF,ADJ, PRECISION,431I,SOIC-8
X3	1	S25068-9SMT	IC,SMD,VOLTAGE REGULATOR,FIXED,3-TERMINAL,0.5A,+15V
X4, X5	2	S25071-2SMT	IC,SMD,PWM-CONTROLLER,SOIC8(SS)
X6, X7	2	S25068-1SMT	IC,SMD,VOLTAGE REGULATOR,FIXED,3-TERMINAL,0.5A,+5V
X8	1	S15128-6SMT	IC,SMD,VOLTAGE REGULATOR,FIXED,3-TERMINAL,1A,+15V
X9	1	S25068-10SMT	IC,SMD,VOLTAGE REGULATOR,FIXED,3-TERMINAL,0.5A,-15V

CAPACITORS = MFD/VOLTS
INDUCTANCE = HENRIES
RESISTANCE = OHMS

BUY AS G3632-3F0
PART NO. — IDENTIFICATION CODE

SCHEMATIC REFERENCE: G3631-3F0

BUY PER E3867
TEST PER E3856-P

UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056
ON 2 PLACE DECIMALS IS ± .02
ON 3 PLACE DECIMALS IS ± .002
ON ALL ANGLES IS ± 5.0F A DEGREE
MATERIAL TOLERANCE (T) TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

DESIGN INFORMATION	
DRAWN BY:	
ENGINEER:	
APPROVED:	
REFERENCE:	G3632-2
SCALE:	NONE

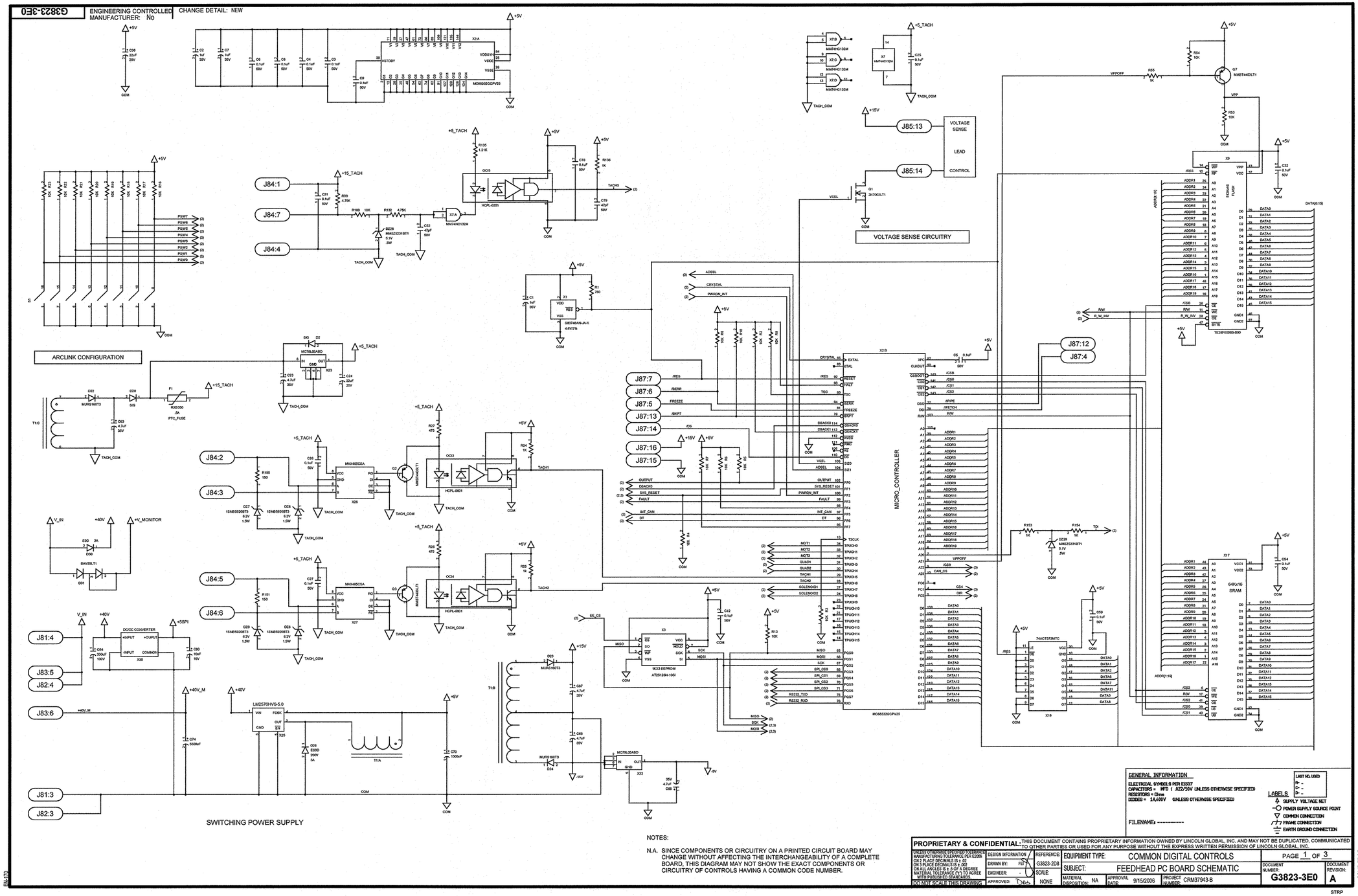
EQUIPMENT TYPE: INVERTER WELDERS
SUBJECT: DIGITAL POWER P.C. BOARD AS'BLY
MATERIAL DISPOSITION: UF | APPROVAL DATE: 9/30/2004 | PROJECT NUMBER: CRM35510-B
PAGE 1 OF 1
DOCUMENT NUMBER: G3632-3
DOCUMENT REVISION: B

FILNO.
SOLID EDGE
STRP

Return to Section TOC
Return to Master TOC

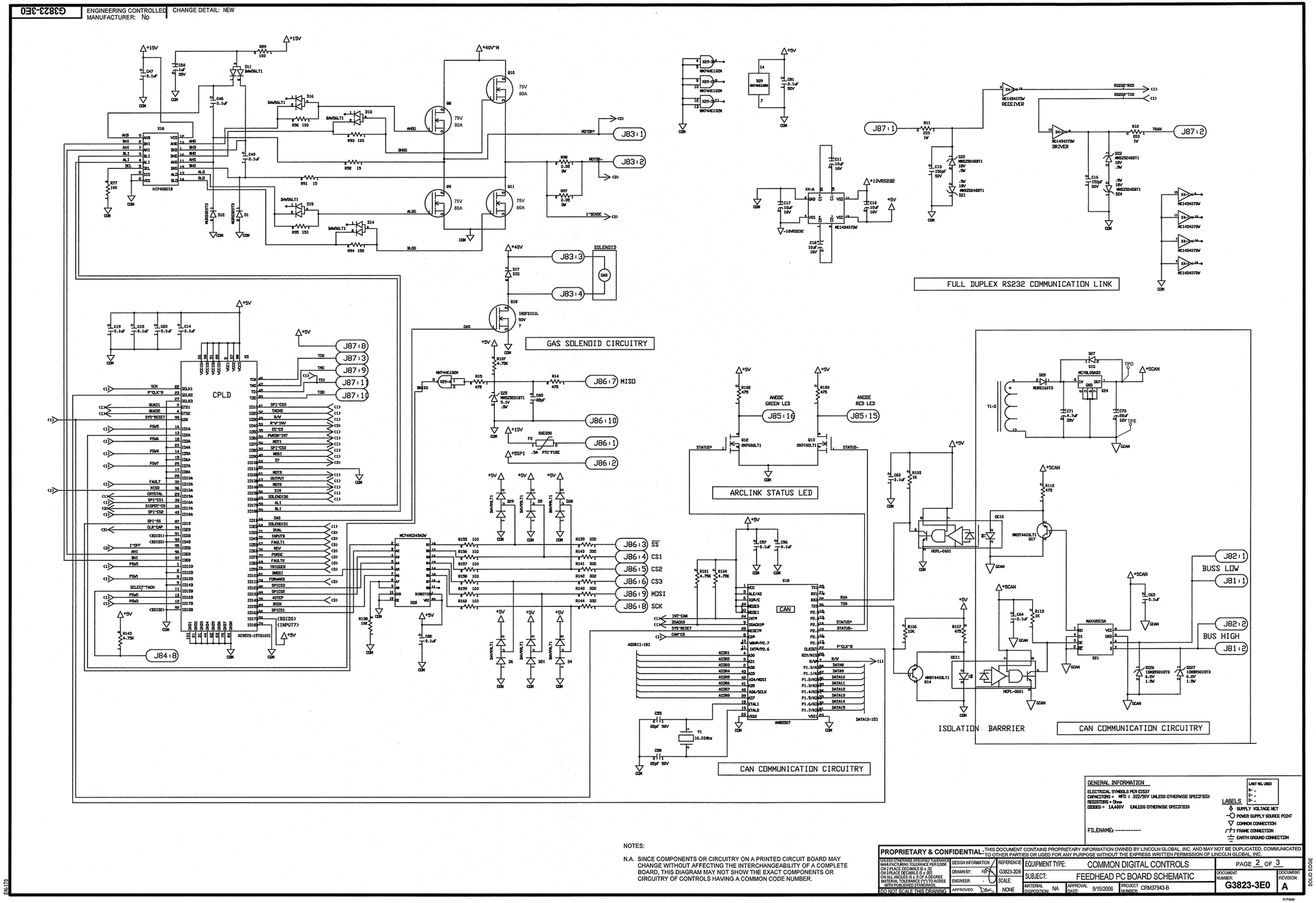
NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

SCHEMATIC - FEEDHEAD PC BOARD #1 (ROBOTIC MODEL ONLY) PG 1 OF 3 (G3823-3)



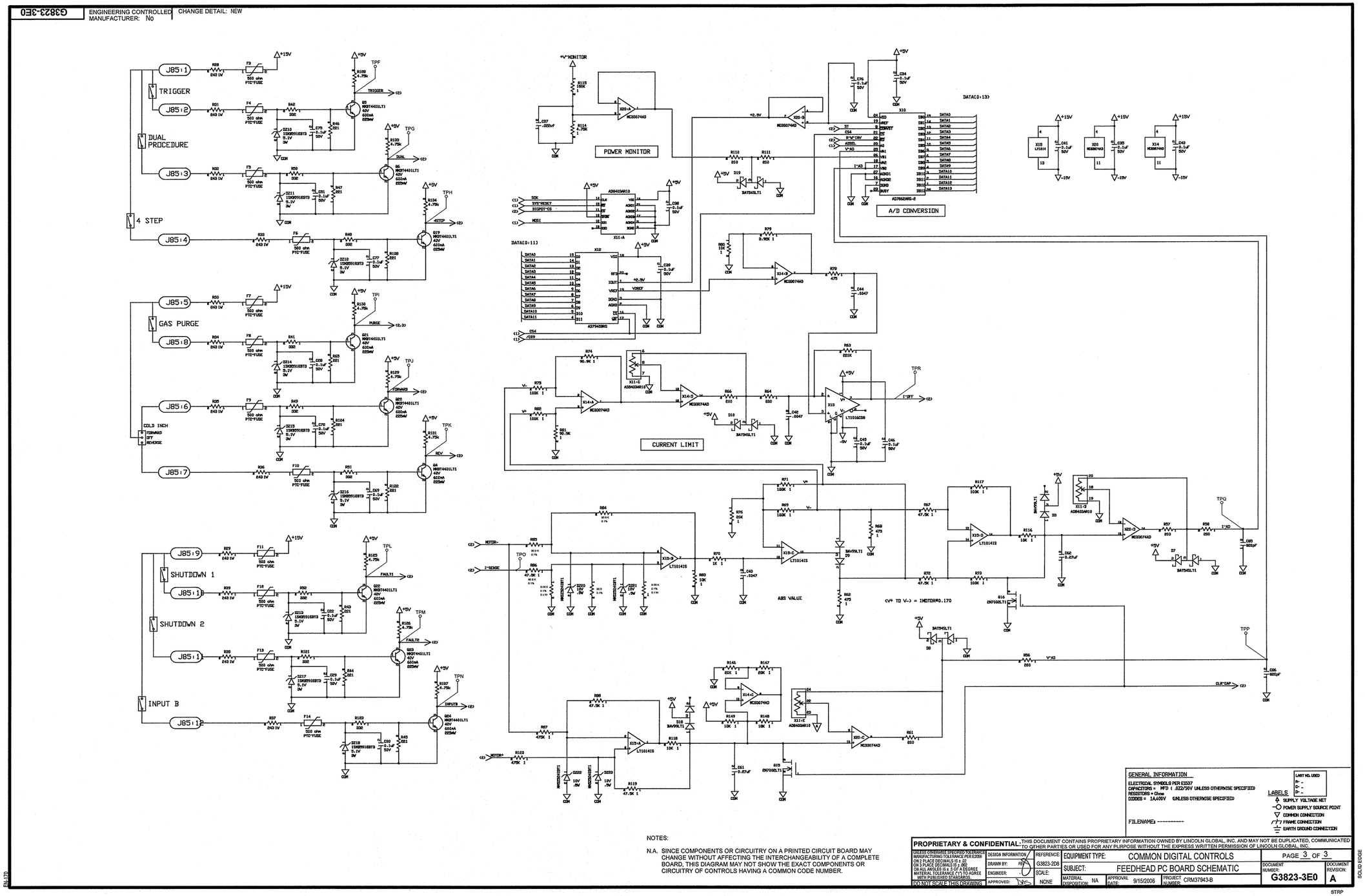
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - FEEDHEAD PC BOARD #2 (ROBOTIC MODEL ONLY) PG 2 OF 3 (G3823-3)



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

SCHEMATIC - FEEDHEAD PC BOARD #3 (ROBOTIC MODEL ONLY) PG 3 OF 3 (G3823-3)



NOTES:

N.A. SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGEABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
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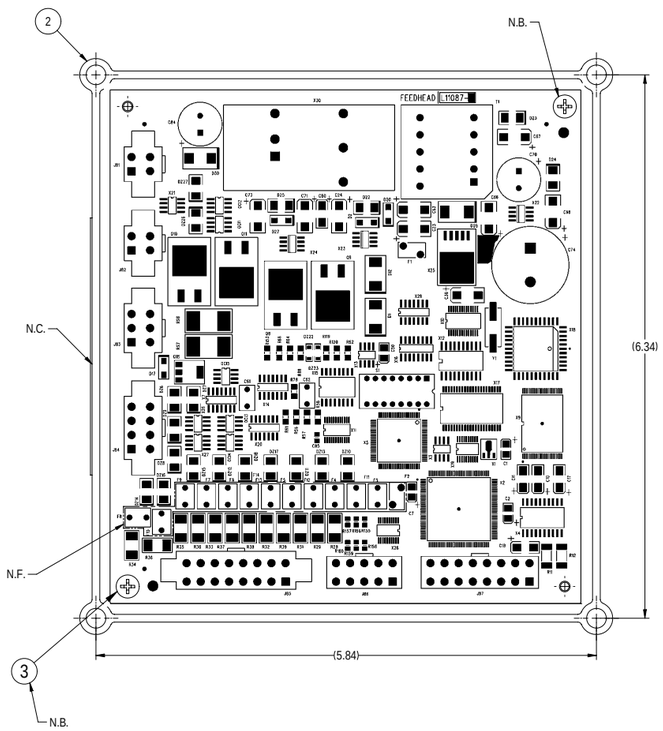
PC BOARD ASSEMBLY - FEEDHEAD PC BOARD (ROBOTIC MODEL ONLY) (L11087-3)

L11087-3 | ENGINEERING CONTROLLED | CHANGE DETAIL: REVISED MAKE SPECIFICATION
MANUFACTURER: Yes



	74	S25001-3320SMT	6	R139,R140,R141,R142,R143,R144	RESISTOR,SMD,332ohms,1/4W,1206,1%
	75	S25005-1SMT	2	R97,R98	SRES,0.05,3W,1%,TR,NP
	76	S25001-4751SMT	4	R99,R114,R132,R137	SRES,4.75K,1206,1% ,1/8W,NP,ISM
	77	S25000-4751SMT	12	R101,R104,R125,R126,R127, R128,R129,R130,R131,R133, R134,R145	SRES,4.75K,0805,1% ,TR,NP
	78	S25001-1503SMT	1	R115	SRES,150K,1206,1% ,1/8W,NP
	79	S25000-1211SMT	1	R135	SRES,1.21K,0805,1% ,1/10W,TR,NP
	80	S25000-2002SMT	3	R146,R147,R76	SRES,20K,TKF,0805,1% ,01/10W,TR
	81	S25007-9091SMT	2	R90,R109	RESISTOR,SMD,9.09K,1/10W,0805,0.1%
	82	S19869-8	1	S1	SWT,78B08S,DIP,SPST,8P,NP
	83	S20375-8	1	T1	TFM,1:50/38,NoreasSwitching Pwr
	84	S25068-7SMT	1	X1	SICS,4.6V,2% ,VOLT. DETECTOR
	85	M15101-14SMT	1	X2	SICS,MC68332,MICRCONTROLLER,TQ
	86	S25069-2SMT	1	X3	SICS,25128,SERIAL EEPR,NP
	87	S20353-1SMT	1	X4	SICS,MC145407,RECEIVER/DRVR,RS
N.D.	88	S25070-6SMT	1	X5	SICS,XC9572-15,CPLD,TQ100,NP
	89	S17900-24SMT	2	X7,X29	SICS,74HC132,NP
N.E.	90	S25069-24SMT	1	X9	SICS, FLASH ROM, 16 x 256K, 70 NS
	91	S25066-2SMT	1	X10	SICS,AD7862,DUAL,12BIT,250kSPS
	92	S25057-3SMT	1	X11	SICS,AD8403ARU10,DIGITAL POT,NP
	93	M15105-9ASM	1	X12	SICS,AD7945,12BIT,PARALLEL,DAC
	94	S15128-21SMT	1	X13	SICS,LT1016,COMPARATOR,NP
	95	S15128-18SMT	2	X14,X20	SICS,MC33074,QUAD,OPAMP,SO14,T
	96	S15128-16SMT	1	X15	ICS,SMD,OP-AMP,QUAD,HIGH PERFORMANCE 1014
	97	S15018-20SMT	1	X16	SICS,HIP4082,H-BRIDGE,FET DRIVE
	98	M15104-15	1	X17	IC,SMD,CMOS,RAM,STATIC,16-BIT,64K X 16
	99	S20353-5	1	X18	SICS,AN82527,CAN CONTROLLER,PL
	100	S25065-2SMT	1	X19	SICS,74ACT573,OCTAL TRANS. LAT
	101	S20353-4SMT	3	X21,X26,X27	SICS,MAX485,TRANSCEIVER,NP
	102	S25068-8SMT	1	X22	SICS,78L05,V-REG,-5V,SO8
	103	S25068-6SMT	2	X23,X24	SICS,78L05,V-REG,+5V,SO8
	104	S15128-25SMT	1	X25	SICS,LM2576HVS-5.0,VREG,60V,SWI
	105	S17900-11SMT	1	X28	SICS,74HC245,SOL20,HCMOS,NP
	106	S24841-1	1	X30	ICS,DC/DC,5V,3A OUT,36-75V IN
	107	S25082-1SMT	1	Y1	SXTL,16MHz,HC40,20pF,NP
	108	S25000-1000SMT	6	R155,R156,R157,R158,R159,R160	RESISTOR,SMD,100,1/10W,0805,1%

UNLESS OTHERWISE SPECIFIED:
RESISTANCE = OHMS

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253

REVISION CONTROL

L11087-3E0

PART NO. IDENTIFICATION CODE
TEST PER E3856-FH
POT WITH E2527
SCHEMATIC REFERENCE: G3823-3E0

BUY DETAIL	MAKE DETAIL
BUY PER E3867	MANUFACTURE PER E1911-ROHS BUY BLANK COMPLETE (4 BOARDS PER PANEL)

4 LAYER BOARD BLANK PANEL
SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION.

ITEM	PART NO.	QTY	PC BOARD REFERENCE DESIGNATORS	DESCRIPTION
1	L11087-E	1		FEED HEAD PC BOARD BLANK
2	M19436-5	1		POTTING TRAY
3	S8025-80	2		SELF TAPPING SCREW
4	E2527	199g 6.88 OZ.		EPOXY ENCAPSULATING RESIN
5	E3539	AS REQ.		ELECTRICAL INSULATING COMPOUND
N.D. 6	Y00552-5	1	X5	SOFTWARE,CPLD
N.E. 7	S24823-5	1	X9	SOFTWARE,FLASH
	FOR ITEMS LISTED BELOW REFER TO ELECTRONIC COMPONENT DATABASE FOR COMPONENT SPECIFICATIONS			
8	S25024-2SMT	4	C1,C2,C7,C50	SCAP,1uF,TAN,3528,35V,TR,NP
9	S25020-3SMT	47	C3,C4,C5,C6,C8,C9,C12,C14, C15,C19,C20,C22,C25, C26,C27,C28,C29,C30,C31, C32,C34,C35,C38,C39,C41, C43,C45,C46,C47,C48,C49, C51,C54,C56,C57,C59,C60, C64,C65,C69,C72,C75,C76, C77,C78,C81,C82	SCAP,0.1uF,0805,50V,X7R,10%,TR
10	S25024-8SMT	5	C10,C11,C17,C18,C80	SCAP,10uF,TAN,6032,16V,10%,TR,NP
11	S25020-1SMT	2	C13,C16	SCAP,150pF,,CER,0805,100V,COG,5% ,TR,NP
12	S25024-5SMT	6	C23,C63,C66,C67,C68,C71	SCAP,4.7uF,TAN,7343,35V,10%,TR,NP
13	S25024-10SMT	3	C24,C36,C73	SCAP,22uF,TAN,7343,25V,10% ,POLAR,TR
14	S25020-2SMT	1	C37	SCAP,0.022uF,,0805,50V,X7R,10% ,
15	S25020-10SMT	3	C40,C42,C44	SCAP,4700pF,,0805,50V,X7R,10% ,T
16	S25020-9SMT	2	C52,C79	SCAP,47pF,,0805,50V,COG,5% ,TR,N
17	S25020-15SMT	3	C55,C58,C83	SCAP,22pF,,0805,50V,COG,5% ,TR,N
18	S24833-1	2	C61,C62	CAP,0.27UF,PCF,63V,5% ,TR,NP
19	S13490-179	1	C70	CAP,1000uF,,ALU,,35V,,20% ,NP
20	S13490-182	1	C74	CAP,3300uF,,ALU,,63V,,20% ,NP
21	S13490-184	1	C84	CAP,330uF,,100V
22	S25020-4SMT	2	C85,C86	CAPACITOR ,SMD,CERAMIC,820PF,50V,5% COG,S0805
23	S25040-12SMT	2	D1,D12	SDIO,MURS320T3,3A,200V,ULTRAFA
24	S25040-2SMT	4	D2,D17,D20,D27	SDIO,400V,0.8A,NP
25	S25040-5SMT	10	D3,D4,D5,D6,D9,D18,D21,D28,D29, D31	SDIO,BAV99LT1,SOT23,DUAL SWITC
26	S25049-4SMT	4	D7,D8,D10,D19	SDIO,BAT54S,DUAL/SERIES,30V,20
27	S25040-4SMT	5	D11,D13,D14,D15,D16	SDIO,BAW56LT1,SOT23,DUAL SWT,T
28	S25040-11SMT	4	D22,D23,D24,D25	SDIO,MURS160,1A,600V,FAST RECO
29	S25040-9SMT	1	D26	SDIO,3A,200V,,D0- 214AB,UFR
30	S25040-10SMT	1	D30	DIODE,SMD,3A,400V
31	S25046-3SMT	4	DZ1,DZ2,DZ3,DZ4	SDIO,MMSZ5248B,18V,ZENER,TR,NP
32	S25046-1SMT	3	DZ5,DZ28,DZ29	SDIO,MMSZ5231BT1,5.1V,NP
33	S25044-9SMT	6	DZ6,DZ7,DZ8,DZ9,DZ26,DZ27	SDIO,1SMB5920BT3,6.2V,NP
34	S25044-1SMT	9	DZ10,DZ11,DZ12,DZ13,DZ14, DZ15,DZ16,DZ17,DZ18	SDIO,1SMB5918BT3,3W,5.1V,5% ,TR,NP
35	S25046-2SMT	4	DZ20,DZ21,DZ22,DZ23	SDIO,MMSZ5240BT1,10V,500mW,ZEN
36	S18380-5	2	F1,F2	RES,50,VAR,PTC,NP
37	S18380-14	12	F3,F4,F5,F6,F7,F8,F9,F10, F11,F12,F13,F14	RES,500,PTC,265V
38	S24020-4	2	J81,J82	CON,MOLEX,15-97-7042,MINI,PCB,4 PIN,TIN
39	S24020-6	1	J83	CON,MOLEX,15-97-7062,MINI,PCB,6 PIN,TIN
40	S24020-8	1	J84	CON,MOLEX,15-97-7082,MINI,PCB,8 PIN,TIN
41	S24020-16	1	J85	CON,MOLEX,15-97-7162,MINI,PCB,16 PIN,TIN
42	S18248-10	1	J86	CON,10P,MINI,NP
43	S18248-16	1	J87	CON,MOLEX,39-28-1163,PCB,16 PIN,TIN
44	S15000-28SMT	4	OCI1,OCI2,OCI3,OCI4	SICS,Optocoupler, HCPL-0601 (SO-8)
45	S15000-26SMT	1	OCI5	SICS,HCPL-0201,OPTOCOUPLE
46	S25051-4SMT	5	Q1,Q12,Q13,Q15,Q16	STRA,2N7002,TR,NP, (SM400-020)
47	S25050-2SMT	5	Q2,Q3,Q7,Q14,Q17	STRA,2N4403,SO23,TR,(500475),N
48	S25050-1SMT	9	Q4,Q5,Q6,Q19,Q20,Q21,Q22,Q23,Q 24	STRA,2N4401,SOT-23,NPN,TR,
49	S25051-16SMT	4	Q8,Q9,Q10,Q11	STRA,75A,55V,0.007 OHM FET,N-CHAN
50	S23060-1SMT	1	Q18	IC,SMD,SWITCH,LO-SIDE,2.2A60V,
51	S25000-1002SMT	24	R2,R3,R4,R5,R6,R7,R9,R16, R17,R18,R19,R20,R21,R22, R23,R53,R54,R77,R80,R106, R116,R138,R148,R149	SRES,10K,0805,1% ,1/10W,TR,NP
52	S25001-1002SMT	6	R8,R10,R13,R83,R100,R118	SRES,10K,MF,1206,1% ,1/8W,TR
53	S25011-9092SMT	4	R84,R85,R86,R152	RESISTOR,SMD,90.9K,1/4W,1206,0.1%
54	S25003-2000SMT	2	R11,R12	SRES,200,2512,5% ,1W,TR,NP
55	S25001-4750SMT	9	R14,R15,R62,R68,R78,R102, R103,R107,R112	SRES,475,1206,1% ,1/8W,TR,NP
56	S25000-1001SMT	8	R24,R25,R55,R105,R113, R136,R153,R154	SRES,1K,0805,1% ,1/10W,TR,NP
57	S25000-4750SMT	2	R26,R27	SRES,475,0805,1% ,TR,NP
58	S25004-2430SMT	12	R28,R29,R30,R31,R32,R33, R34,R35,R36,R37,R38,R39	SRES,243,WSC-1,1% ,1W,TR,NP
59	S25000-3320SMT	9	R41,R42,R48,R49,R50,R51, R52,R121,R123	SRES,332,0805,1% ,1/10W,TR,NP
60	S25000-2210SMT	9	R43,R44,R45,R46,R47,R65, R108,R122,R124	SRES,221,TKF,0805,1% ,1/10W,TR
61	S25001-2000SMT	8	R56,R57,R58,R61,R64,R66, R110,R111	SRES,200,1206,1% ,1/8W,TR,NP
62	S25001-7500SMT	1	R1	RESISTOR,SMD,750ohms,1/4W,1206,1%
63	S25000-2213SMT	1	R63	SRES,221K,TKF,0805,1% ,01/10W,TR
64	S25000-4752SMT	2	R67,R72	SRES,47.5K,TKF,0805,1% ,01/10W,TR
65	S25000-1003SMT	6	R69,R71,R73,R75,R82,R117	SRES,100K,TKF,0805,1% ,01/10W,TR
66	S25001-1001SMT	1	R70	SRES,1K,1206,1% ,1/8W,TR,NP,(09
67	S25000-9092SMT	2	R74,R81	SRES,90.9K,TKF,0805,1% ,1/10W
68	S25000-3921SMT	1	R79	SRES,3.92K,TKF,0805,1% ,1/10W,TR
69	S25001-4753SMT	2	R87,R120	SRES,475K,1206,1% ,1/8W,TR,NP
70	S25001-4752SMT	2	R88,R119	SRES,47.5K,1206,1% ,1/8W,TR,NP
71	S25001-1000SMT	3	R89,R93,R96	SRES,100,1206,1% ,1/8W,TR,NP
72	S25001-15R0SMT	2	R91,R92	SRES,15,1206,1% ,1/8W,TR,NP
73	S25001-1500SMT	4	R94,R95,R150,R151	SRES,150,1206,1% ,1/8W,TR,NP

NOTES:

N.A. CAUTION: THIS DEVICE IS SUBJECT TO DAMAGE BY STATIC ELECTRICITY. LINCOLN ELECTRIC TO SEE E2454 BEFORE HANDLING.

N.B. SECURE PC BOARD ASSEMBLY IN PLACE WITH ITEM 4. (2 PLACES) TIGHTEN SCREWS TO A TORQUE OF 5.3±0.5 IN-LBS.

N.C. PLACE BARCODED ASSEMBLY NUMBER IDENTIFICATION AND BARCODED SERIAL NUMBER IDENTIFICATION IN AREA SHOWN.

N.D. PROGRAM ITEM 88 WITH ITEM 6 .

N.E. PROGRAM ITEM 90 WITH ITEM 7 .

N.F. PARTS INDICATED MUST BE COMPLETELY COVERED WITH ENCAPSULATION.

FOR PARTS ORDERS ONLY:

DO NOT SEND THIS ASSEMBLY.
SEND THE APPROPRIATE HARDWARE/SOFTWARE ASSEMBLY ONLY

UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056
ON 2 PLACE DECIMALS IS ± .02
ON 3 PLACE DECIMALS IS ± .002
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE ("t") TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

DESIGN INFORMATION	
DRAWN BY:	JIMJ
ENGINEER:	DRS
APPROVED:	-
REFERENCE:	L11087-2
SCALE:	1:1

EQUIPMENT TYPE: COMMON DIGITAL CONTROLS
SUBJECT: FEED HEAD PC BOARD ASSEMBLY
MATERIAL DISPOSITION: UF | APPROVAL DATE: 9/18/2006 | PROJECT NUMBER: CRM3440?

PAGE 1 OF 1

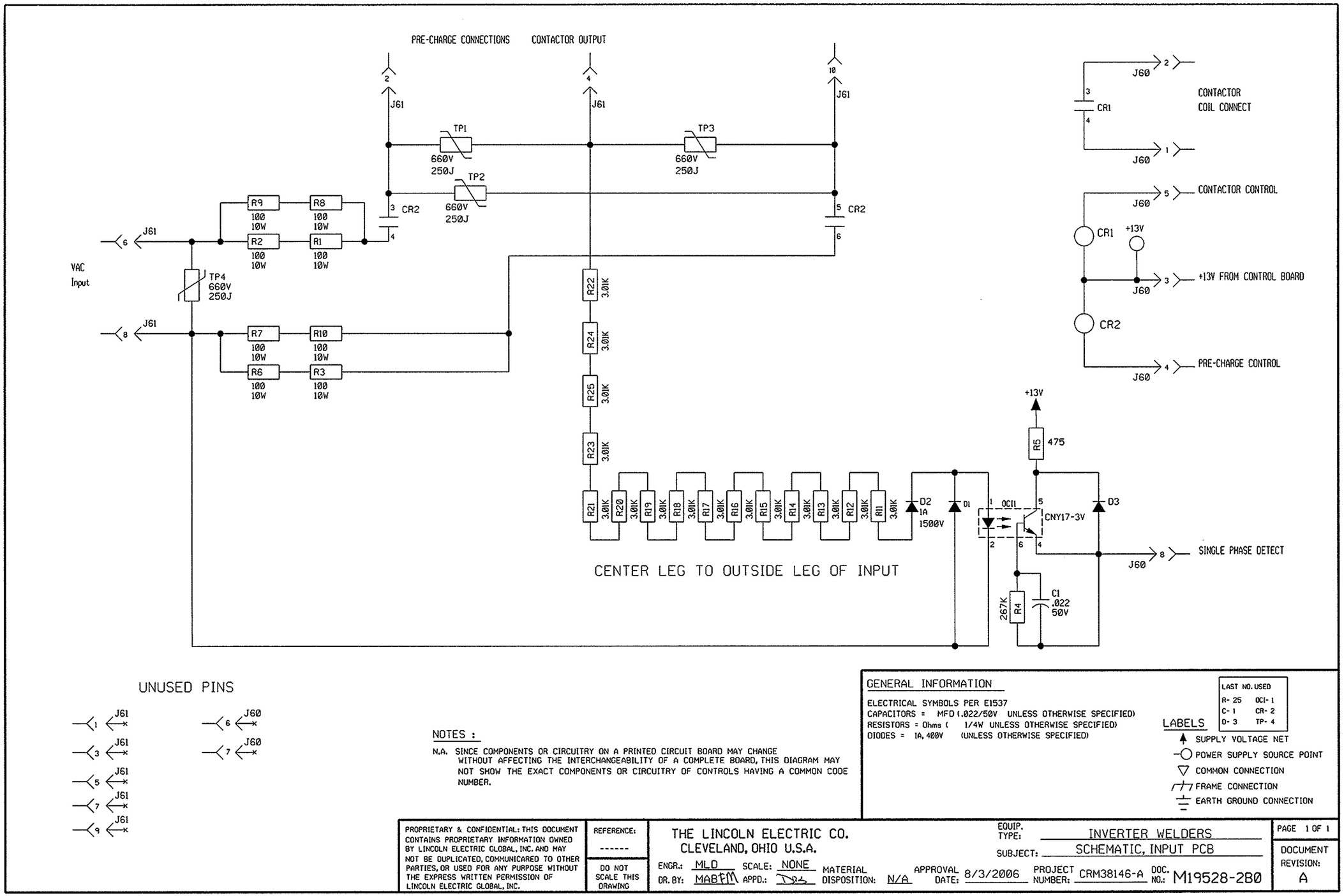
DOCUMENT NUMBER: **L11087-3**
DOCUMENT REVISION: **C.01**

SOLID EDGE

STRP

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

SCHEMATIC - INPUT PC BOARD (ALL CODES) (M19528-2)



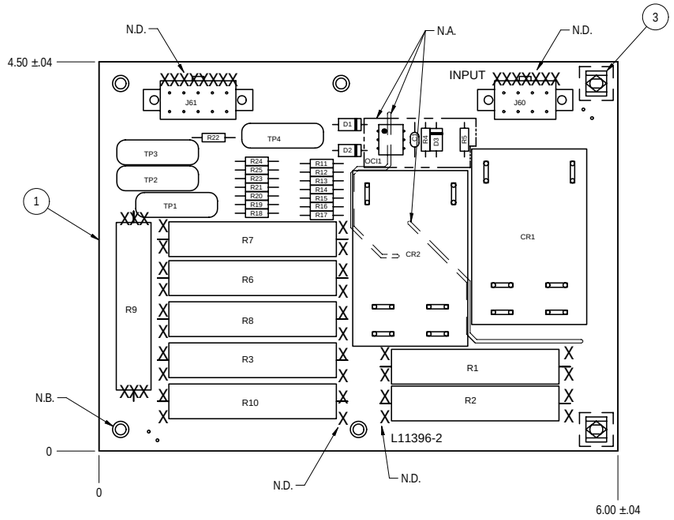
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

PC BOARD ASSEMBLY - INPUT PC BOARD (ALL CODES) (L11396-2)

L11396-2

ENGINEERING CONTROLLED CHANGE DETAIL: REVISED MAKE SPECIFICATION
MANUFACTURER: No

P.C. BOARD BLANK INFORMATION
BUY COMPLETE AS L11396-B
(2 LAYER BOARD PER E3281)
(MAKES 8 BOARDS PER PANEL, SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION)



MAKE PER E1911-ROHS
ENCAPSULATE WITH E1844
TEST PER E3647-I
SCHEMATIC REFERENCE: M19528-2B0

	REFERENCES	QTY	PART NO.	DESCRIPTION
	C1	1	S16668-5	.022/50
	CR1, CR2	2	S14293-18	DPST RELAY
	D1, D3	2	T12199-1	1N4004
	D2	1	T12705-58	DIODE,1.0A,1500V
N.C.	J60	1	S24020-8	HEADER,VERTICAL
N.C.	J61	1	S24020-10	HEADER,VERTICAL
	OCI1	1	S15000-22	OPTO ISOLATOR
	R1, R2, R3, R6, R7, R8, R9, R10	8	S24376-3	100/1OW
	R4	1	S19400-2673	267K 1/4W
	R5	1	S19400-4750	475 1/4W
	R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25	15	S19400-3011	3.01K 1/4W
	TP1, TP2, TP3, TP4	4	T13640-23	MOV,250J,660V

ITEM	REQ'D	PART NO.	IDENTIFICATION
1	1	SEE BLANK INFO.	P.C. BD. BLANK
2	1.0 OZ.	E2861	SEALANT
3	2	S14020-7	PLASTIC EXPANSION NUT

CAPACITORS = MFD / VOLTS

RESISTORS = OHMS/WATTS

N.A. THIS AREA TO BE COVERED ON BOTH SIDES OF BOARD WITH ITEM 2 PRIOR TO ENCAPSULATION. MATERIAL MUST BE APPLIED THRU SLOTS FROM BOTTOM SIDE TO COMPLETELY FILL TO UNDERSIDE OF DEVICE ON COMPONENT SIDE.

N.B. P.C. BOARD HOLES TO BE FREE OF ENCAPSULATION MATERIAL.

N.C. DO NOT COAT WITH ENCAPSULATION MATERIAL.

N.D. APPLY ITEM 2 AS SHOWN, ALL EXPOSED LEADS MUST BE COVERED. MATERIAL MUST BE APPLIED PRIOR TO ENCAPSULATION.

N.E. APPLY ITEM 2 ON NON-COMPONENT SIDE OF BOARD PRIOR TO ENCAPSULATION. ALL EXPOSED PINS MUST BE COVERED.

MANUFACTURED AS:

L11396-2B0

IDENTIFICATION CODE

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253.

UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056
ON 2 PLACE DECIMALS IS ± .02
ON 3 PLACE DECIMALS IS ± .002
ON ALL ANGLES IS ± 5.0 F A DEGREE
MATERIAL TOLERANCE (*1) TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

DESIGN INFORMATION
DRAWN BY: FEI
ENGINEER:
APPROVED: -

REFERENCE: L11396-1
SCALE: 1:1

EQUIPMENT TYPE: INVERTER WELDERS
SUBJECT: INPUT P.C. BOARD ASSEMBLY
MATERIAL DISPOSITION: UF
APPROVAL DATE:
PROJECT NUMBER: CRM34409

PAGE 1 OF 1
DOCUMENT NUMBER: L11396-2
DOCUMENT REVISION: B.01

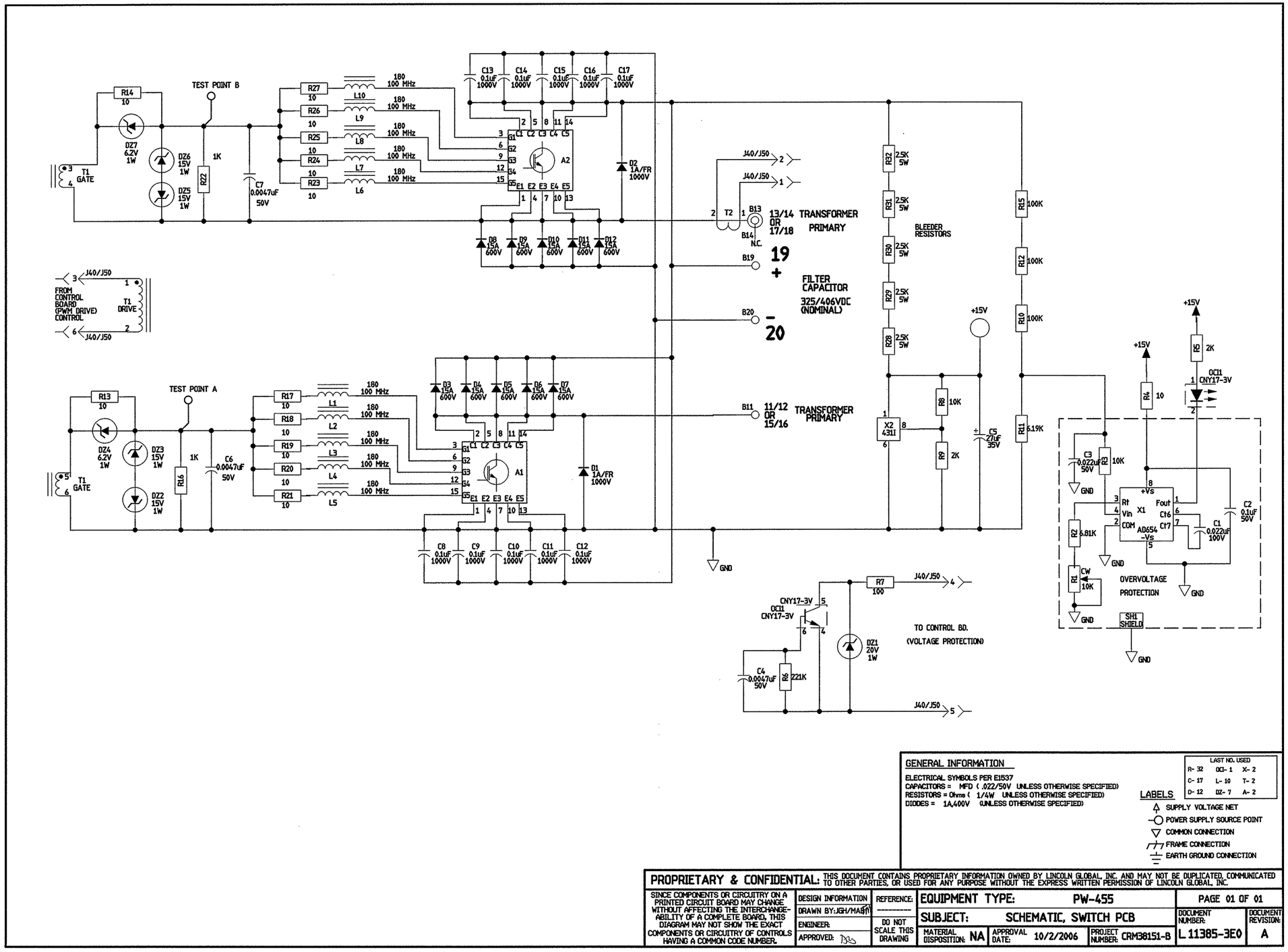
SOLID EDGE

STRP

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Return to Section TOC Return to Master TOC

SCHEMATIC - SWITCH PC BOARD (ALL CODES) (L11385-3)



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

PC BOARD ASSEMBLY - SWITCH PC BOARD (ALL CODES) (G3734-3)

G3734-3 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: REVISED MAKE SPECIFICATION

NOTES :

N.A. CAUTION: THIS DEVICE IS SUBJECT TO DAMAGE BY STATIC ELECTRICITY. SEE E2454 BEFORE HANDLING.

N.D. FEMALE EYELET TO BE AGAINST THE COPPER SIDE AS SHOWN. EYELET MUST NOT SPIN AFTER CLINCHING.

N.E. SOLDER EYELET SO THAT SOLDER COVERS ENTIRE EYELET AND ALL AROUND EYELET ON COPPER SIDE ONLY. NO ICICLES OR SOLDER BLOBS PERMITTED. MUST BE SMOOTH AND EVEN WITHIN .020" OVER SURFACE.

N.H. MOLEX CAVITIES AND AREA AROUND LOCKING TAB TO BE FREE OF ENCAPSULATION MATERIAL. MASK PER APPROPRIATE MANUFACTURING WORK INSTRUCTIONS.

N.J. ELECTRONIC MODULES TO BE ASSEMBLED, SOLDERED, AND SEALED TO PC BOARD PER E3875.

N.M. DO NOT COAT THE TOP SURFACES OR THE THREADS WITH ENCAPSULANT MATERIAL (1 TERMINAL). MASK PER APPROPRIATE MANUFACTURING WORK INSTRUCTIONS.

N.Q. BRACKET MUST HAVE FULL MATING CONTACT WITH POWER TERMINAL AND HAVE HOLES ALIGNED.

N.R. ELECTRONIC MODULES ON A COMMON P.C. BOARD ASSEMBLY TO HAVE THE SAME VENDOR CODE.

e.g. M21214-2 X XX XXX.....
VENDOR CODE
VCE(SAT)
VGE(TH)

N.S. AFTER SOLDERING, INSPECT TERMINAL CONNECTIONS PER E1880.

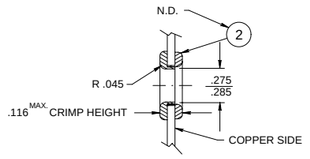
N.T. ENCAPSULATE COMPONENT SIDE OF P.C. BOARD TO A THICKNESS OF .30 +.12/-.00 IN AREA SHOWN.

N.U. ENCAPSULATE NON COMPONENT SIDE OF P.C. BOARD TO A THICKNESS OF .25 +.12/-.00.

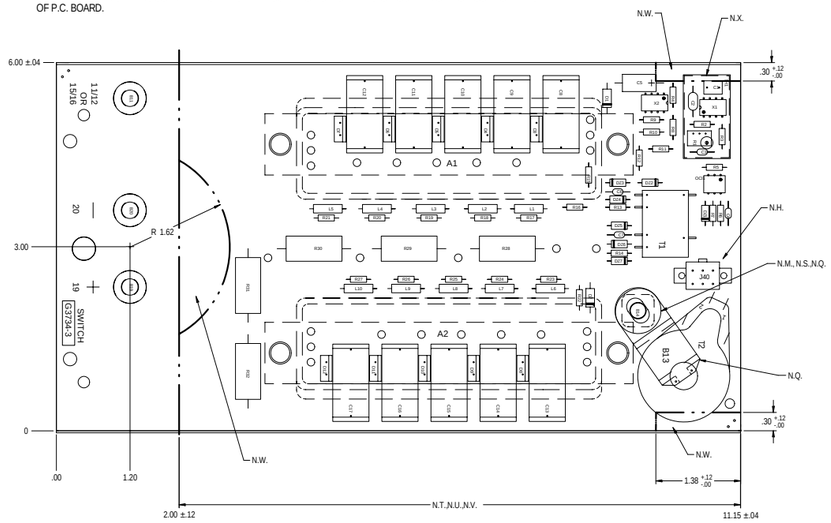
N.V. ENCAPSULATION MATERIAL MUST EXTEND BEYOND EDGES OF P.C. BOARD .12 +.12/-.00.

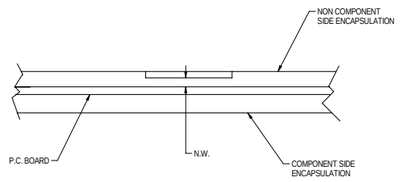
N.W. ENCAPSULATE OPPOSITE COMPONENT SIDE OF P.C. BOARD IN AREAS SHOWN TO A MAXIMUM THICKNESS OF .20.

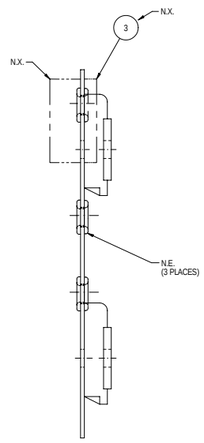
N.X. BOTH P.C. BOARD SHIELDS SOLDER INTO THE SAME MOUNTING HOLES. ITEM 3 IS MOUNTED ON NON-COMPONENT SIDE OF P.C. BOARD.



EYELET DETAIL







P.C. BOARD BLANK REFERENCE INFORMATION

BUY COMPLETE AS G3734-E (4 LAYER BOARD PER E3281)

(SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION)

	ITEM (USED WITH)*	QTY	PART NUMBER	DESCRIPTION
	1	1	G3734-E	PC BOARD BLANK
N.D.	2 (B11, B19, B20)*	3	T9147-11	CONNECTOR,EYELET,POWER,FEMALE
N.X.	3	1	S24869-2	PC BOARD SHIELD
	4	280 g	E2527	EPOXY ENCAPSULATING RESIN

REFER TO ELECTRONIC COMPONENT DATABASE FOR SPECIFICATIONS ON ITEMS LISTED BELOW

	REFERENCES	QTY	PART NUMBER	DESCRIPTION
N.A.,N.J.,N.R.	A1, A2	2	M21214-2	ELECTRONIC MODULE,5-T12704-84 IGBT'S
	B11, B19, B20	3	T9147-15	CONNECTOR,EYELET,POWER,MALE
N.Q.	B13	1	S24866	BRACKET,POWER-HOLDER
N.Q.	B14	1	S23006	CONNECTOR,TERMINAL,POWER
	C1	1	S20500-14	CAPACITOR,PPMF,.022,100V,BOX,5%
	C2	1	S16668-11	CAPACITOR,CEMO,0.1, 50V,10%
	C3	1	S16668-5	CAPACITOR,CEMO,.022,50V,20%
	C4, C6, C7	3	S16668-6	CAPACITOR,CEMO,.4700pF.50V,10%
	C5	1	S13490-93	CAPACITOR,TAEL,27,35V,10%
	C8, C9, C10, C11, C12, C13, C14, C15, C16, C17	10	S20500-1	CAPACITOR,PPMF.0.1,1000V,10%,BOX
	D1, D2	2	T12705-44	DIODE,AXLDS,1A,1000V,FR, 818
	D3, D4, D5, D6, D7, D8, D9, D10, D11, D12	10	T12705-32	DIODE,TO220,15A,600V,FR,MUR1560
	DZ1	1	T12702-4	ZENER DIODE,1W,20V,5%,1N4747A
	DZ2, DZ3, DZ5, DZ6	4	T12702-29	ZENER DIODE,1W,15V,5%,1N4744A
	DZ4, DZ7	2	T12702-40	ZENER DIODE,1W,6.2V,5%,1N4735A
	J40	1	S24020-6	CONNECTOR,MOLEX,MINI,PCB,6-PIN,TIN
	L1, L2, L3, L4, L5, L6, L7, L8, L9, L10	10	T12218-15	CHOKE,RF,FERRITE BEAD,180 OHM
	OC#1	1	S15000-22	OPTOCOUPLER,PHOTO-Q,70V,CNY17-3VDE
	R1	1	S16296-5	TRIMMER,MT,1/2W,10K, 10%,LINEAR
	R2	1	S19400-6811	RESISTOR,MF,1/4W,6.81K,1%
	R3, R8	2	S19400-1002	RESISTOR,MF,1/4W,10.0K,1%
	R4, R13, R14, R17, R18, R19, R20, R21, R23, R24, R25, R26, R27	13	S19400-10R0	RESISTOR,MF,1/4W,10.0,1%
	R5, R9	2	S19400-2001	RESISTOR,MF,1/4W,2.00K,1%
	R6	1	S19400-2213	RESISTOR,MF,1/4W,221K,1%
	R7	1	S19400-1000	RESISTOR,MF,1/4W,100,1%
	R10, R12, R15	3	S19400-1003	RESISTOR,MF,1/4W,100K,1%
	R11	1	S19400-6191	RESISTOR,MF,1/4W,6.19K,1%
	R16, R22	2	S19400-1001	RESISTOR,MF,1/4W,1.00K,1%
	R28, R29, R30, R31, R32	5	T14648-9	RESISTOR,WW,5W,2.5K,5%,SQ
N.X.	SH1	1	S24869-1	PC BOARD SHIELD,0.75 X 1.35
	T1	1	T12737-7	TRANSFORMER,PULSE,3-WINDING
	T2	1	M19612	CURRENT-TRANSDUCER,125-TURN
	X1	1	M13552-3	IC,CONVERTER,V/F,654
	X2	1	S15128-10	VOLTAGE REF,ADJ, PRECISION,431I

MAKE PER E1911-ROHS
POT PER E1911-E
TEST PER E3901-SW

SCHEMATIC REFERENCE: L11385-3E0

MANUFACTURED AS:

G3734-3E0

IDENTIFICATION CODE

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253.

FOR PARTS ORDERS OR SUBSIDIARY ORDERS INCLUDE ONE G3010PRINT, ONE M19661PRINT, ONE S25254PRINT AND ONE T12837-1.

UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2000
ON 2 PLACE DECIMALS IS ± .02
ON 3 PLACE DECIMALS IS ± .002
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE (T) TO AGREE WITH PUBLISHED STANDARDS
DO NOT SCALE THIS DRAWING

DESIGN INFORMATION:	REFERENCE:	EQUIPMENT TYPE: INVERTER WELDERS	PAGE 1 OF 1
DRAWN BY: FEI	G3734-2	SUBJECT: SWITCH P.C. BD ASSEMBLY	DOCUMENT NUMBER: G3734-3 / DOCUMENT REVISION: B.01
ENGINEER:	SCALE: 1:1	MATERIAL DISPOSITION: UF / APPROVAL DATE: / PROJECT NUMBER: CRM34409	
APPROVED: -			

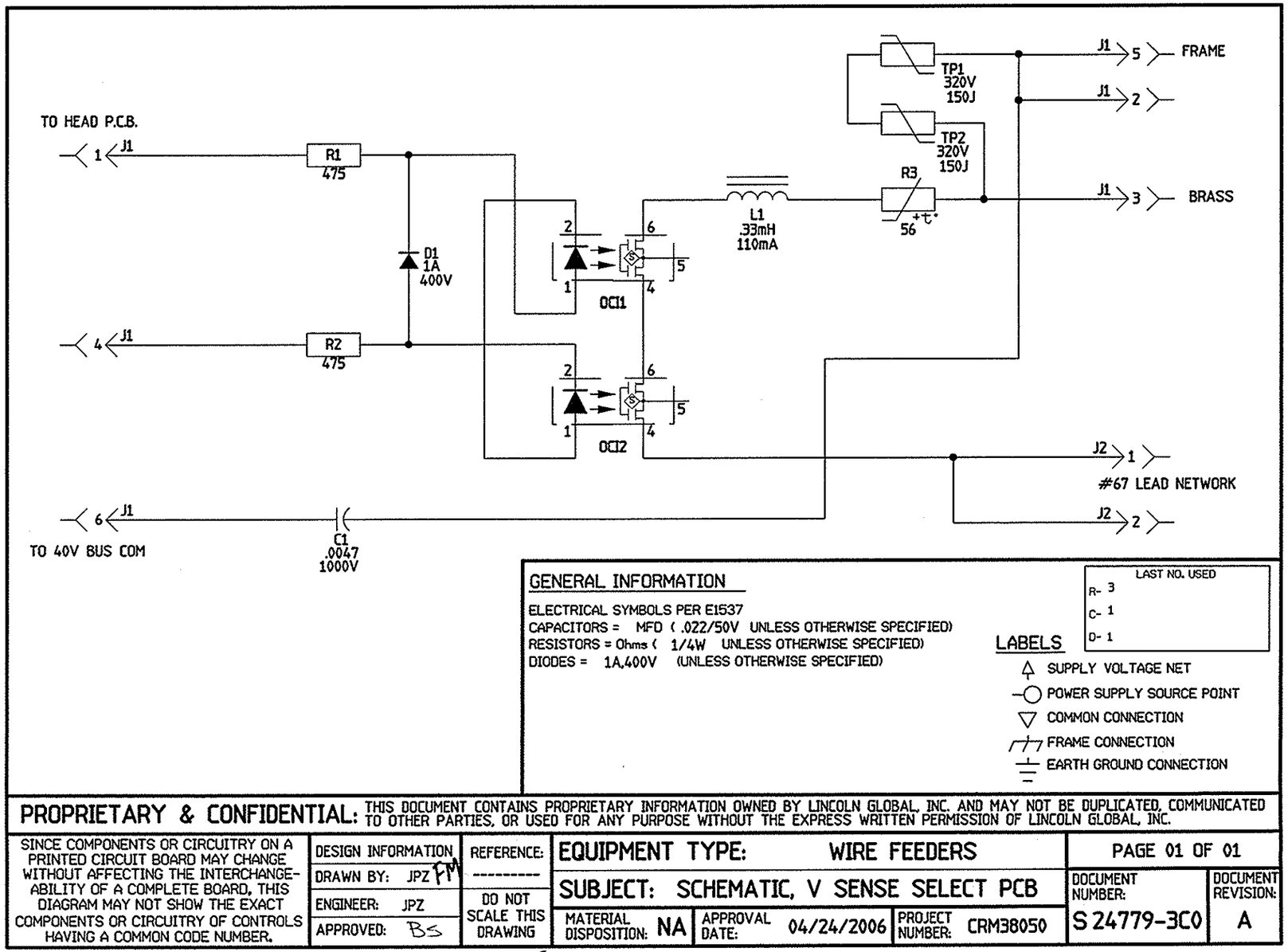
SOLID EDGE

STRP

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC Return to Master TOC

SCHEMATIC - VOLTAGE SENSE PC BOARD (ROBOTIC MODEL ONLY) (S24779-3)



SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGE-ABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.	DESIGN INFORMATION DRAWN BY: JPZ FM ENGINEER: JPZ APPROVED: BS	REFERENCE: --- DO NOT SCALE THIS DRAWING	EQUIPMENT TYPE: WIRE FEEDERS SUBJECT: SCHEMATIC, V SENSE SELECT PCB MATERIAL DISPOSITION: NA / APPROVAL DATE: 04/24/2006 / PROJECT NUMBER: CRM38050	PAGE 01 OF 01 DOCUMENT NUMBER: S 24779-3C0	DOCUMENT REVISION: A

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

PC BOARD ASSEMBLY - VOLTAGE SENSE PC BOARD (ROBOTIC MODEL ONLY) (M19540-3)

M19540-3

ENGINEERING CONTROLLED
MANUFACTURER: No

CHANGE DETAIL: REVISED MAKE SPECIFICATION

	ITEM	REQD	PART NO.	IDENTIFICATION
	C1	1	S20500-4	.0047 1000V
	D1	1	T12199-1	1N4004
N.A.	J1	1	S24020-6	HEADER
N.A.	J2	1	S24020-2G	HEADER
	L1	1	T12218-7	330uH
	OCI1,OCI2	2	S15000-20	PHOTO FET
	R1,R2	2	S19400-4750	475 1/4W
	R3	1	S18380-1	THERMISTOR,PTC
	TP1,TP2	2	T13640-18	160J

P.C. BOARD BLANK INFORMATION
BUY COMPLETE AS M19540-C
(2 LAYER BOARD PER E3281)
(MAKES 54 BOARDS PER PANEL, SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION)

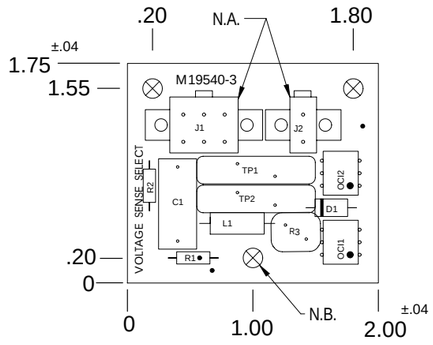
CAPACITORS = MFD/VOLTS
RESISTORS = OHMS
INDUCTANCE = HENRYS

ITEM	REQD	PART NO.	DESCRIPTION
1	1	SEE BLANK INFO	P.C. BOARD BLANK

SCHEMATIC REFERENCE: S24779-3CO

N.A. DO NOT COAT WITH ENCAPSULATION MATERIAL.

N.B. DO NOT COAT WITH ENCAPSULATION MATERIAL
.23 MIN. DIA. (3 PLACES) ON NON COMPONENT SIDE.



MANUFACTURED AS

M19540-3CO

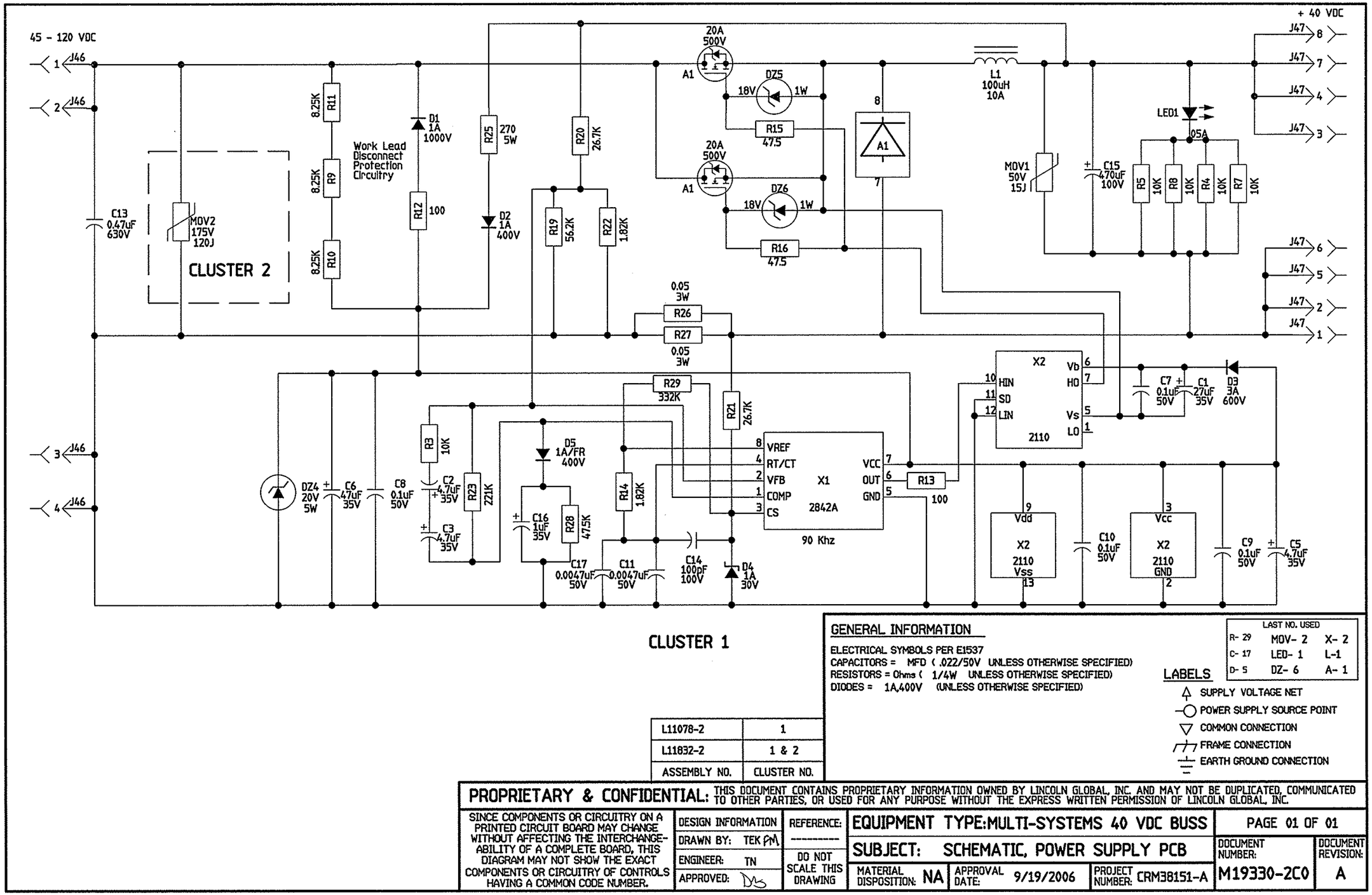
IDENTIFICATION CODE

MAKE PER E1911-ROHS
ENCAPSULATE WITH E1844 (2 DIPS)
TEST PER E3689-VS

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253.

UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056 ON 2 PLACE DECIMALS IS ± .02 ON 3 PLACE DECIMALS IS ± .002 ON ALL ANGLES IS ± .5 OF A DEGREE MATERIAL TOLERANCE ("t") TO AGREE WITH PUBLISHED STANDARDS. DO NOT SCALE THIS DRAWING	DESIGN INFORMATION DRAWN BY: FEI ENGINEER: APPROVED: -	REFERENCE: M19540-2 SCALE: 1:1	EQUIPMENT TYPE: COMMON DIGITAL CONTROLS SUBJECT: VOLTAGE SENSE PC BRD AS'BLY MATERIAL DISPOSITION: UF APPROVAL DATE: PROJECT NUMBER: CRM34409	PAGE 1 OF 1 DOCUMENT NUMBER: M19540-3	DOCUMENT REVISION: C.01	SOLID EDGE STRP

SCHEMATIC - 40 VDC BUS PC BOARD (ALL CODES) (M19330-2)



L11078-2	1
L11832-2	1 & 2
ASSEMBLY NO.	CLUSTER NO.

GENERAL INFORMATION

ELECTRICAL SYMBOLS PER E1537
CAPACITORS = MFD (.022/50V UNLESS OTHERWISE SPECIFIED)
RESISTORS = Ohms (1/4W UNLESS OTHERWISE SPECIFIED)
DIODES = 1A,400V (UNLESS OTHERWISE SPECIFIED)

LAST NO. USED		
R- 29	MOV- 2	X- 2
C- 17	LED- 1	L-1
D- 5	DZ- 6	A- 1

LABELS

- SUPPLY VOLTAGE NET
- POWER SUPPLY SOURCE POINT
- COMMON CONNECTION
- FRAME CONNECTION
- EARTH GROUND CONNECTION

SINCE COMPONENTS OR CIRCUITRY ON A PRINTED CIRCUIT BOARD MAY CHANGE WITHOUT AFFECTING THE INTERCHANGE-ABILITY OF A COMPLETE BOARD, THIS DIAGRAM MAY NOT SHOW THE EXACT COMPONENTS OR CIRCUITRY OF CONTROLS HAVING A COMMON CODE NUMBER.	DESIGN INFORMATION DRAWN BY: TEK ENGINEER: TN APPROVED:	REFERENCE: --- DO NOT SCALE THIS DRAWING	EQUIPMENT TYPE: MULTI-SYSTEMS 40 VDC BUSS SUBJECT: SCHEMATIC, POWER SUPPLY PCB MATERIAL DISPOSITION: NA / APPROVAL DATE: 9/19/2006 / PROJECT NUMBER: CRM38151-A	PAGE 01 OF 01	DOCUMENT NUMBER: M19330-2C0	DOCUMENT REVISION: A

NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

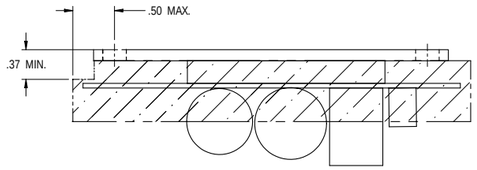
Return to Section TOC
Return to Master TOC

PC BOARD ASSEMBLY - 40 VDC BUS PC BOARD (ALL CODES) (L11078-2)

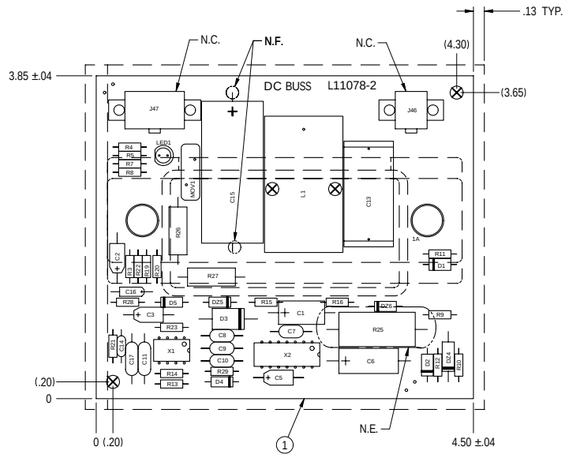
L11078-2 | ENGINEERING CONTROLLED MANUFACTURER: No | CHANGE DETAIL: REVISED MAKE SPECIFICATION

P.C. BOARD BLANK INFORMATION

BUY COMPLETE AS L11078-C (4 LAYER BOARD PER E3281)
MAKES 12 BOARDS PER PANEL. PANEL SIZE PER E1911.
(SEE ELECTRONIC FILE FOR ADDITIONAL INFORMATION)



POTTING DIMENSIONS



MAKE PER E1911-ROHS
POT PER E1911-E
TEST PER E3862
SCHEMATIC REFERENCE - M19330-2C0

MANUFACTURED AS:
L11078-2C0
IDENTIFICATION CODE

	REFERENCE	QTY	PART NO.	DESCRIPTION
N.A., N.B., N.D.	A1	1	M21214-6	ELECTRONIC MODULE,2 MOSFETS(T12704-71)WITH 1DIO
	C1	1	S13490-93	CAPACITOR,TAEL,27,35V,10%
	C2, C3, C5	3	S13490-25	CAPACITOR,TAEL,4.7,35V 10%
	C6	1	S13490-66	CAPACITOR,TAEL,47,35V 10%
	C7, C8, C9, C10	4	S16668-11	CAPACITOR,CEMO,0.1, 50V,10%
	C11, C17	2	S16668-10	CAPACITOR,CEMO,4700P, 50V,2%
	C13	1	S20500-2	CAPACITOR,PPMF,0.47,630V,10%,BOX
	C14	1	S16668-3	CAPACITOR,CEMO,100P, 100V,5%
	C15	1	S13490-174	CAPACITOR,ALEL,470,100V,+50/-10%, LOW PROFILE
	C16	1	S13490-42	CAPACITOR,TAEL,1.0,35V,10%
	D1	1	T12199-2	DIODE,AXLDS,1A,1000V
	D2	1	T12199-1	DIODE,AXLDS,1A,400V
	D3	1	T12705-59	DIODE,AXLDS,3A,600V,UFR
	D4	1	T12705-23	DIODE,SCHOTTKY,AXLDS,1A,30V,1N5818
	D5	1	T12705-34	DIODE,AXLDS,1A,400V,FR,1N4936
	DZ4	1	T12702-25	ZENER DIODE,5W,20V,5% 1N5357B
	DZ5, DZ6	2	T12702-45	ZENER DIODE, 1W,18V,5% 1N4746A
	J46	1	S24020-4	CONNECTOR,MOLEX,MINI,PCB,4-PIN,TIN
	J47	1	S24020-8	CONNECTOR,MOLEX,MINI,PCB,8-PIN,TIN
	L1	1	T12218-16	CHOKE,HIGH-CURRENT,100UH,10A,10%, LOW PROFILE
	LED1	1	T13657-2	LED,T-1,3/4,RED,HLMP-3003
	MOV1	1	T13640-15K	MOV,50VRMS,15J,14MM
	R3, R4, R5, R7, R8	5	S19400-1002	RESISTOR,MF,1/4W,10.0K,1%
	R9, R10, R11	3	S19400-8251	RESISTOR,MF,1/4W,8.25K,1%
	R12, R13	2	S19400-1000	RESISTOR,MF,1/4W,100,1%
	R14, R22	2	S19400-1821	RESISTOR,MF,1/4W,1.82K,1%
	R15, R16	2	S19400-47R5	RESISTOR,MF,1/4W,47.5,1%
	R19	1	S19400-5622	RESISTOR,MF,1/4W,56.2K,1%
	R20, R21	2	S19400-2672	RESISTOR,MF,1/4W,26.7K,1%
	R23	1	S19400-2213	RESISTOR,MF,1/4W,221K,1%
	R25	1	T14648-17	RESISTOR,WW,5W,270,5%,SQ
	R26, R27	2	T12300-86	RESISTOR,WW,3W,0.05,1%
	R28	1	S19400-4752	RESISTOR,MF,1/4W,47.5K ,1%
	R29	1	S19400-3323	RESISTOR,MF,1/4W,332K,1%
N.A.	X1	1	M15458-4	IC,PWM-CONTROLLER,IMODE,2842A
N.A.	X2	1	S15018-16	IC,CMOS,DRIVER,MOSFET,2110(SS)

CAPACITOR = MFD/VOLTS
RESISTORS = OHMS, 1/4 WATT (UNLESS OTHERSIDE SPECIFIED)

ITEM	REQ'D	PART NO.	DESCRIPTION
1	1	SEE BLANK INFO.	P.C. BOARD BLANK
3	100 g.	E2527	EPOXY ENCAPSULATION RESIN
4	.75 oz.	E2861	SEALANT

N.A. CAUTION: THIS DEVISE IS SUBJECT TO DAMAGE BY STATIC ELECTRICITY. SEE E2454 BEFORE HANDLING.
N.B. COVER EXPOSED BOTTOM SURFACE OF ELECTRONIC MODULE TO AVOID POTTING MATERIAL BUILD UP.
N.C. MOLEX CAVITIES AND AREA AROUND TAB TO BE FREE OF POTTING MATERIAL. MASK PER APPROPRIATE MANUFATURING WORK INSTRUCTIONS.
N.D. ELECTRONIC MODULES TO BE ASSEMBLED AND ENCAPSULTED PER E3875.
N.E. COMPLETELY COVER EXPOSED LEADS AND BODY OF R25 RESISTOR WITH ITEM 4 SEALANT.
N.F. COVER EXPOSED LEADS OF C15 CAPACITOR WITH ITEM 4 SEALANT.

ALL COMPONENTS AND MATERIALS USED IN THIS ASSEMBLY ARE TO BE RoHS COMPLIANT PER E4253.

FOR PARTS ORDERS ONLY:
INCLUDE (1) S25191PRINT AND (1) T12837-1

UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056
ON 2 PLACE DECIMALS IS ± .02
ON 3 PLACE DECIMALS IS ± .002
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE ("|") TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

DESIGN INFORMATION
DRAWN BY: FEI
ENGINEER:
APPROVED: -

REFERENCE: L11078-1
SCALE: NONE

EQUIPMENT TYPE: MULTI-WELD 350
SUBJECT: 40V DC BUS P.C. BOARD ASSEMBLY
MATERIAL DISPOSITION: UF
APPROVAL DATE:
PROJECT NUMBER: CRM34409

PAGE 1 OF 1
DOCUMENT NUMBER: L11078-2
DOCUMENT REVISION: B.01

SOLID EDGE
STRP

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

Return to Section TOC
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